COADS
Comprehensive Ocean–Atmosphere Data Set
Release 1

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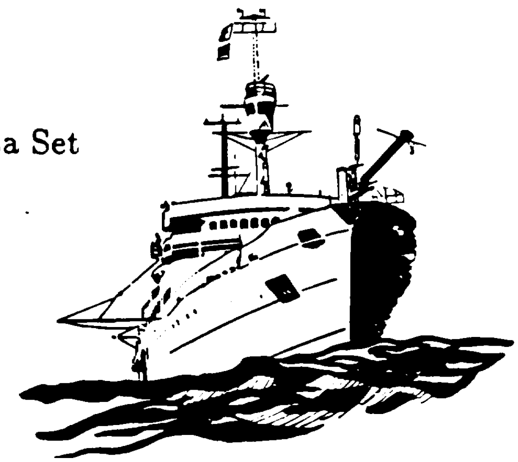

CIRES University of Colorado/NOAA
Cooperative Institute for Research in Environmental Sciences
Ralph J. Slutz
Sandra J. Lubker
Jane D. Hiscox

ERL U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
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Scott D. Woodruff

NCAR National Science Foundation sponsored
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Roy L. Jenne
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National Environmental Satellite, Data, and Information Service
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NOTICE

Document available in Climate Research Program, ERL, Boulder, Colorado.

Foreword

To understand climate variability we must first delineate what kind of behaviour must be understood. Do changes in the more energetic parts of the global climate machine occur gradually or suddenly? If there are clear ”climate signals,” where in the global domain do they appear first? How do they evolve in time? Do the signals reflected in various geophysical fields relate to one another in physically consistent ways? Do the forcing fields exhibit time variability that is consistent with the response fields? What does the behaviour tell us about possible causes of climatic variability?

The opportunity to explore such questions has been severely limited by the availability of observations reflecting past behaviour. Only since the advent of satellites have we been able to observe some few parameters on a global basis. Only since World War II have there been enough upper air observations to explore the vertical dimension and they are sparsely distributed. Only with surface observations can we extend the record of past behaviour back into the last century

In doing so, we find that the land stations having long records are too few to delineate spatial variability, over the planet. Over the ocean areas, however, ship observations provide a richer record. They are good enough to delineate the time variability of the major wind systems and related fields of surface pressure and temperature.

The incentive for developing the Comprehensive Ocean–Atmosphere Data Set (COADS) was to make this record available to the individual investigator in a form that is reliable and easy to use. The global marine surface data set contains the most detailed record we will ever have of the dynamics of the global climate system over the last century and more. It should trigger rapid progress in understanding by making it possible to delineate the spatial and temporal characteristics of the several sharp adjustments of the global circulation that have occurred, and to glean from them clues to the nature and causes of global climate variability. COADS provides the material for diagnostic research to identify and explore the key questions. It also provides the needed boundary conditions for model simulation of the climate system variability.

It has taken four years and much effort by many individuals and several institutions to obtain and process the hundreds of tapes containing the basic data input. All of this effort was provided from ongoing activities; there was no appropriation identified for the task. It is a tribute to the spirit of cooperation among the participating organizations that the task has been successfully completed.

Throughout the effort, the support and encouragement of Dr. Wilmot N. Hess was crucial, as Director of ERL during the early stages and as Director of NCAR during the later stages.

Joseph O. Fletcher

Acknowledgments

J. Fletcher and U. Radok helped initiate and guide this project through the years; W. Hess at NCAR provided both computing resources and encouragement necessary to complete it. T. Potter provided essential support in the early stages. Many others contributed advice or assistance, among them: G. Caldwell, R. Cram, S. Esbenson, R. Keen, S. Khalsa, D. McLain, A. Oort, R. Quayle, C. Ramage, R. Reynolds, D. Shea, S. Warren, and B. Weare.

There would be no release without the programmers who have worked on it. Thanks to all of them including T. Brown, W. Otto, Y. Pann, T. Parker, J. Souder, W. Spangler, G. Walters, and X. Zhang. Thanks also to Martha Rife, because there would be no release without her invaluable typing.

The project has been cooperatively supported by funding from ERL, NCAR, and NCDC, with additional support from the Equatorial Pacific Ocean Climate Studies (EPOCS) program for the work by CIRES and ERL.

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Abstract

Global marine data observed during 1854–1979, primarily by ships–of–opportunity, have been collected, edited, and summarized statistically for each month of each year of the period, using 2° latitude x 2° longitude boxes. Products now available in a first release from this Comprehensive Ocean Atmosphere Data Set (COADS) include fully quality–controlled (trimmed) reports and summaries. Each of the 70 million unique reports contains 28 elements of weather, position, etc., as well as nags indicating which observations were statistically trimmed. The summaries give 14 statistics, such as the median and mean, for each of eight observed variables of air and sea surface temperatures, wind, pressure, humidity, and cloudiness, plus 11 derived variables. Relatively noisy (untrimmed) individual reports and summaries (giving 14 statistics for each of the eight observed variables) are available for investigators who prefer their own quality control. Two other report forms, inventories, and decade–month summaries are among the other data products available. FORTRAN 77 software available to help read "packed binary" data products and processing details, such as the method of identifying duplicate reports, are also described.

0. Introduction

Since 1854, ships of many countries have been taking regular observations of local weather, sea surface temperature, and many other characteristics near the boundary between the ocean and the atmosphere. The observations by one such ship–of–opportunity, at one time and place, usually incidental to its voyage, make up a marine report. In later years fixed research vessels, buoys, and other devices have contributed data. Marine reports have been collected, often in machine–readable form, by various agencies and countries. That vast collection of data, spanning the global oceans from the mid–nineteenth century to date, is the historical ocean atmosphere record.

The aim of this project was to assemble and reduce machine–readable portions of the available historical ocean–atmosphere record into a regular, compact, easily–used data base at three principal resolutions: 1) individual reports, 2) year–month summaries of the individual reports in 2° latitude x 2° longitude boxes, and 3) decade–month summaries. Duplicate reports judged inferior by a first quality control process designed by the National Climatic Data Center (NCDC) were eliminated or flagged, and "untrimmed" monthly and decadal summaries were computed for acceptable data within each 2° latitude x 2° longitude box. Tighter, mediansmoothed limits were used as criteria for statistical rejection of apparent outliers from the data used for separate sets of "trimmed" monthly and decadal summaries. Individual observations were retained in report form but flagged during this second quality control process if then fell outside 2.8 or 3.5 (trimmed from statistics) estimated standard–deviations about the smoothed median applicable to their 2°

latitude x 2° longitude box, month, and 56–, 40–, or 30– year period (i.e., 1854–1909, 1910–1949, or 1950–1909).

Eight "observed" variables were included in the untrimmed monthly summaries:

1	S	sea surface temperature
2	A	air temperature
3	W	scalar wind
4	U	vector wind eastward component
5	V	vector wind northward component
6	P	sea level pressure
7	C	total cloudiness
8	Q	specific humidity

Included in the trimmed monthly summaries were the eight observed variables plus 11 derived variables:

9	R	relative humidity
10	D	S – A = sea–air temperature difference
11	E	(S – A)W = sea–air temperature difference* wind magnitude
12	F	Q_δ – Q = (saturation Q at S) – Q
13	G	FW (Q_δ – Q)W (evaporation parameter)
14	X	WU
15	Y	WV (14–15 are wind stress parameters)
16	I	UA
17	J	VA
18	K	UQ
19	L	VQ (16–19 are sensible and latent heat transport parameters)

For each variable, 14 statistics were computed:

1	d	mean day–of–month of observations
2	h	hour statistic
3	x	mean longitude of observations
4	y	mean latitude of observations
5	n	number of observations
6	m	mean
7	s	standard deviation
8	0	0/6 sextile (the minimum)
9	1	1/6 sextile (a robust estimate of m – 1s)
10	2	2/6 sextile
11	8	3/6 sextile (the median)
12	4	4/6 sextile
13	5	5/6 sextile (a robust estimate of m + 1s)

14 6 6/6 sextile (the maximum)

All the other historical observations, such as present and past weather, visibility, and waves, are available in report form.

This report gives an overall description of the workplan, indicating products available in this first release of the Comprehensive Ocean–Atmosphere Data Set (COADS). Sources of the data, some characteristics of their distribution in time and space, and cautions in using them are also included. Product formats, software listings, processing details, and background material are presented in supplements A –K to this report. A number enclosed in brackets refer to references, e.g., [1].

Release 1 of COADS offers 14 data products; 13 available from the National Center for Atmospheric Research (NCAR), and one available from NCDC. Because of the volume of data and for reasons of computational efficiency, all but the NCDC product are stored in ”packed binary” formats, whereby data were coded as positive integers and the resultant binary bitstrings were packed into bytes of the smallest convenient length. Reconstruction of floating–point data requires that the byte length and two other characteristics of each field be externally specified. Machine–transportable* FORTRAN 77 software that includes these specifications is available in addition to the data products (see supp. H).

*Machine–transportable software may require changes to work on different computer systems (given certain minimum machine requirements), but these modifications are few and well defined.

Global systems of numbering 10° latitude x 10° longitude and 2° latitude x 2° longitude boxes** were also developed with the efficient and convenient storage of data in mind. Figure 0 – 1 illustrates the 10 box system, which has box numbers spiralling eastward down from number 1, with its lower–left (SW) corner at 30 E, 80 N, to number 648 at 20 E., 90 S. The

**The notation BOXn (e.g., BOX 2 or BOX 10) will be used to denote an n5 latitude x n5 longitude box, or more simply, n5 box.

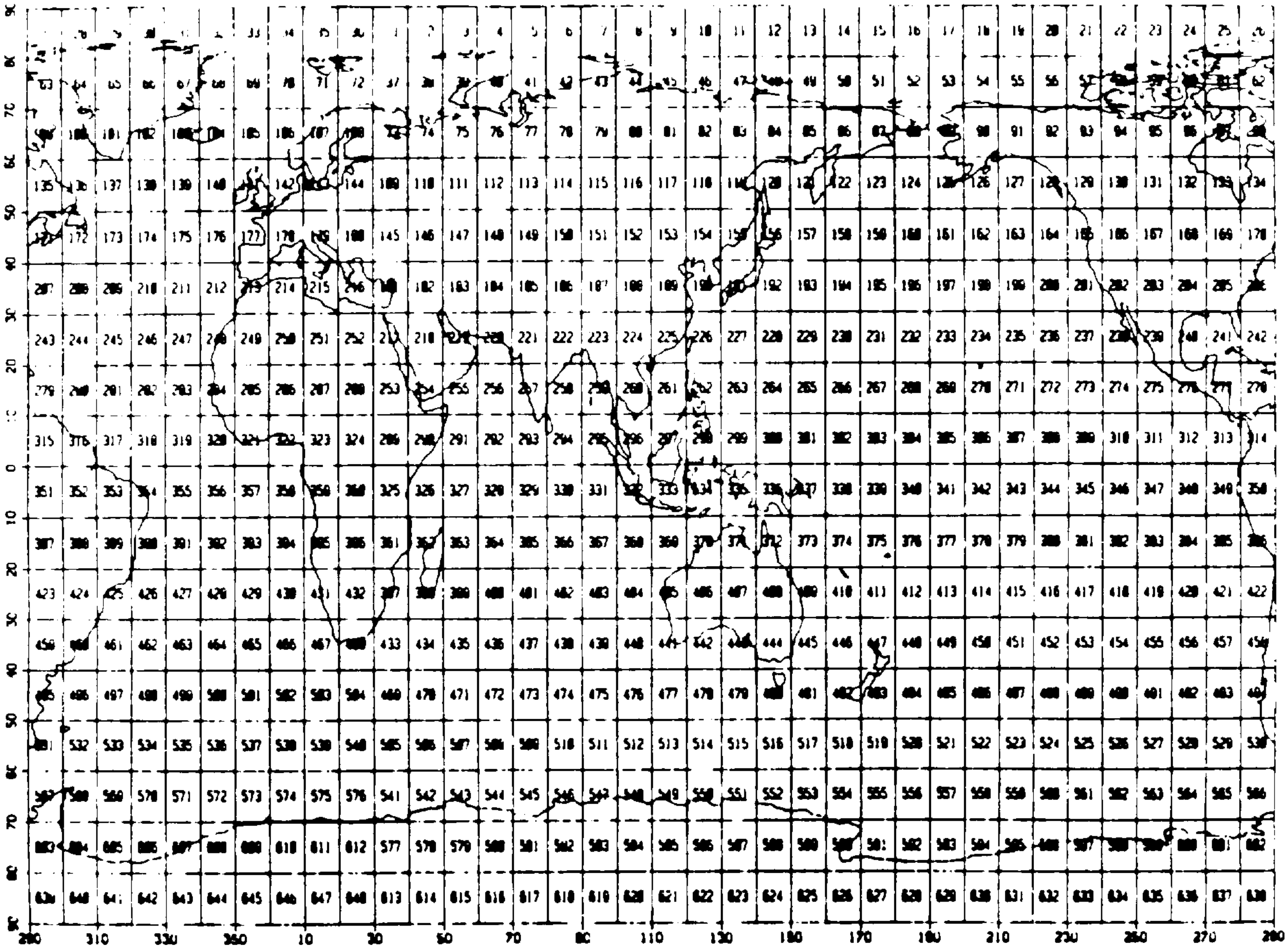


Figure 0-1. 10° box numbering system

30° E division was chosen to avoid splitting any ocean, which facilitates the retrieval of latitude bands of data stored in box-order on serial media (such as magnetic tape). The 2° box system is similar, and these and other location systems, such as the historic system of Marsden Squares still used by NCDC, are described in detail in supp. G .

Any conclusion drawn from the historical record should be qualified by the fact that the observation, reporting, collection, and digitization of these data have been subject to a great dead of methodological change. Besides introducing more or less unknown inhomogeneities into many variables, these changes have sometimes been processed incorrectly. The resulting errors, as well as simple recording or transmission errors, occur very frequently. While a major effort has been made to indicate reports containing errors, some kinds of errors cannot be trapped by statistical methods. A very common error in the original data was incorrect representation of latitude and longitude, and only in extreme cases were these identified. Thus it must be remembered that while millions of errors have been identified and eliminated from the trimmed summaries, the resulting data are still far from clean. In addition, the distribution of data is highly variable in both time and space. Nevertheless, such a unique and clearly irreplaceable historical record is worthy of exhaustive study on the scale of either weather or climate, provided it is used with careful attention to these characteristics (see sec. 4 for more information).

The period of record is 1854 through 1979;* a few reports found in these data before 1854 are thought to have spurious times digitized and were excluded at later stages of processing. Owing to erroneous latitudes and longitudes, a significant amount of data also falls on land, increasing dramatically with the advent of global telecommunications (c. 1966). However, the increase is only partly real, because some inputs for earlier years had the land data deleted (see sec. 3). Reports for approximate land locations were also flagged or excluded at later stages of processing.

*An update through 1984 of selected products is planned for availability in 1987.

COADS Release 1 is the culmination of four years of cooperation among the Cooperative Institute for Research in Environmental Sciences (CIRES), the Environmental Research Laboratories (ERL). and NCDC, joined in the last three years by NCAR. In addition to specifying requirements for the initial quality control and duplicate elimination process, and checking their proper implementation, NCDC was responsible for acquiring the bulk of the data. Programs for conversion of individual marine reports back and forth from characters to binary, sorting, input/output, and other tasks were written and executed by NCAR staff; quality control, duplicate elimination. reformatting, calculation of monthly and decadal summaries, and trimming were among those accomplished by CIRES and ERL staff. Except for testing and auxiliary steps, processing was accomplished on NCAR computers, especially their previous CDC 7600 and current Cray 1, requiring over 100 hours of Cray-equivalent CPU time.

1. Data Input

An attempt was made to integrate all available, digitized, directly sensed surface-marine data sets that would contribute information of reasonable quality, so that the final set would be as comprehensive as possible. The data sets listed in Table 1-1 were collected and input to the first stages of processing; details on each data set can be found in supp. K . An original goal of the project was to update the Atlas data set used by NCDC to construct a set of marine atlases, e.g., [11], using data from the Historical Sea Surface Temperature (HSST) Data Project. The 1854-1969 period of the Atlas was extended through 1979 using NCDC's '70s Decade data set, and other additions to later years such as buoy, bathythermograph, and IMMPC (International Exchange) data. Other data were included because of their high quality (Ocean Station Vessels) or remote location (South African Whaling). The data sets listed in Table 1–2 were left out for one reason or another; in addition to these, the final data set includes no remotely sensed data.

Table 1–1
Input Sources

	Million reports (approx.)	Source
Atlas	38.6	NCDC
HSST (Historical Sea Surface Temperature Data Project)	25.2	NCDC, Germany
Old TDF – 11 Supplements B and C	7	NCDC
Monterey Telecommunication	4	NCDC
Ocean Station Vessels, and Supplement	0.9	NCDC
Marsden Square 486 Pre–1940	0.07	NCDC
Marsden Square 105 Post–1928	0.1	NCDC
National Oceanographic Data Center (NODC) Surface, and Supplement	2	NCDC
Australian Ship Data (file 1)	0.2	Australia
Japanese Ship Data	0.13	M.I.T.
IMMPC (International Exchange)	3	NCDC
South African Whaling	0.1	NCAR
Eltanin	0.001	NCDC
'70s Decade	18	NCDC
IMMPC (International Exchange)*	0.9	NCDC
Ocean Station Vessel Z*	0.004	NCDC
Australian Ship Data (file 2)*	0.2	Australia
Buoy Data*	0.3	NCDC
'70s Decade Mislocated Data*	0.003	NCDC
	100**	

* Additions solely to 1970–1979 decade.

** The approximate total includes 26.58 million relatively certain duplicates, and some seriously defective or mis–sorted reports, which were removed by initial processing steps.

Table 1–2
Excluded Input Sources

	Million reports (approx.)	Source
Ocean Station Vessel Tipgrade (TD–1160)*	1.71	NCDC
Islas Orcadas (Eltanin)	?	Argentina
FCDS (Fleet Consolidated Data Set)**	20	U.S. Navy
New Navy GTS (Global Telecommunication System)**	?	U.S. Navy
British Marine Data Bank**	40	United Kingdom
TD–1117 U.S. Navy Hourlies (a few were included)	?	NCDC
TD–13SY	?	NCAR
TD–1393 Pickets	?	NCAR
TD–1313 Marine	?	NCAR
National Meteorological Center Data (NMC)*	?	NOAA/NMC

* Many of these data were included from OSV or GTS data (e.g., from U.S. Air, Force Global Weather Central) within sources listed in Table 1–1 .

** It is thought that most of these data were included within sources listed in Table 1–1 .

2. Workplan

The overall workplan is shown jointly by Flowchart 1 (primary processing) and Flowchart 2 (secondary processing). All steps are completed, but five of the nineteen data products are not available because they have been superseded by other products as noted.

The 14 data products that are available for distribution (see secs. 2.1.1 and 2.2.1) are marked "(Avail.)." Currently, the 13 of these products that are recorded in packed binary formats can be obtained on magnetic tape from the

Data Support Section
National Center for Atmospheric Research
P. O. Box 3000
Boulder, CO 80307

or individual reports in an ascii–character format (TD–1129) can be obtained from the

Director
National Climatic Data Center
NOAA, Federal Building
Asheville, NC 28801

(Basic sets of reports and statistics, as updated, will be available indefinitely; minor products may later be reviewed for retention.) Descriptions of the available products and some of the other products and processes shown will be found in supps. A –K . See supp. H for listings of FORTRAN 77 software that may assist users in reading packed binary data products these programs are also available at NCAR on magnetic tape.

Even though packed binary methods were employed to store all but one (product 19; TD–1129) of the 14 available data products, some of them are still very voluminous. This is because of the diversity of observed and statistical information, and the wide coverage and fine resolution in both space and time. For users not needing complete data products. copies can usually be made for selected areas or times by NCAR or NCDC.

Since the 1970–1979 decade was processed separately throughout the initial work, separate '70s and pre–'70s files are provided for individual marine reports and other initial products (as noted in each product description in secs. 2.1.1 and 2.2.1). Depending on the application, this may or may not be a convenience to the user. An effort was made to integrate the two periods in all the final monthly summaries and other products of later stages of processing, as well as to remove data before 1854. Data over land were also removed only at later stages. This provides a measure of positional noise to be expected in supposedly legitimate samples. Supp. G shows approximately which 2° boxes are over land; a machine–readable world map showing the land boxes is available at NCAR, and was used in deleting "landlocked" data.

2.1 Primary Processing: Flowchart 1

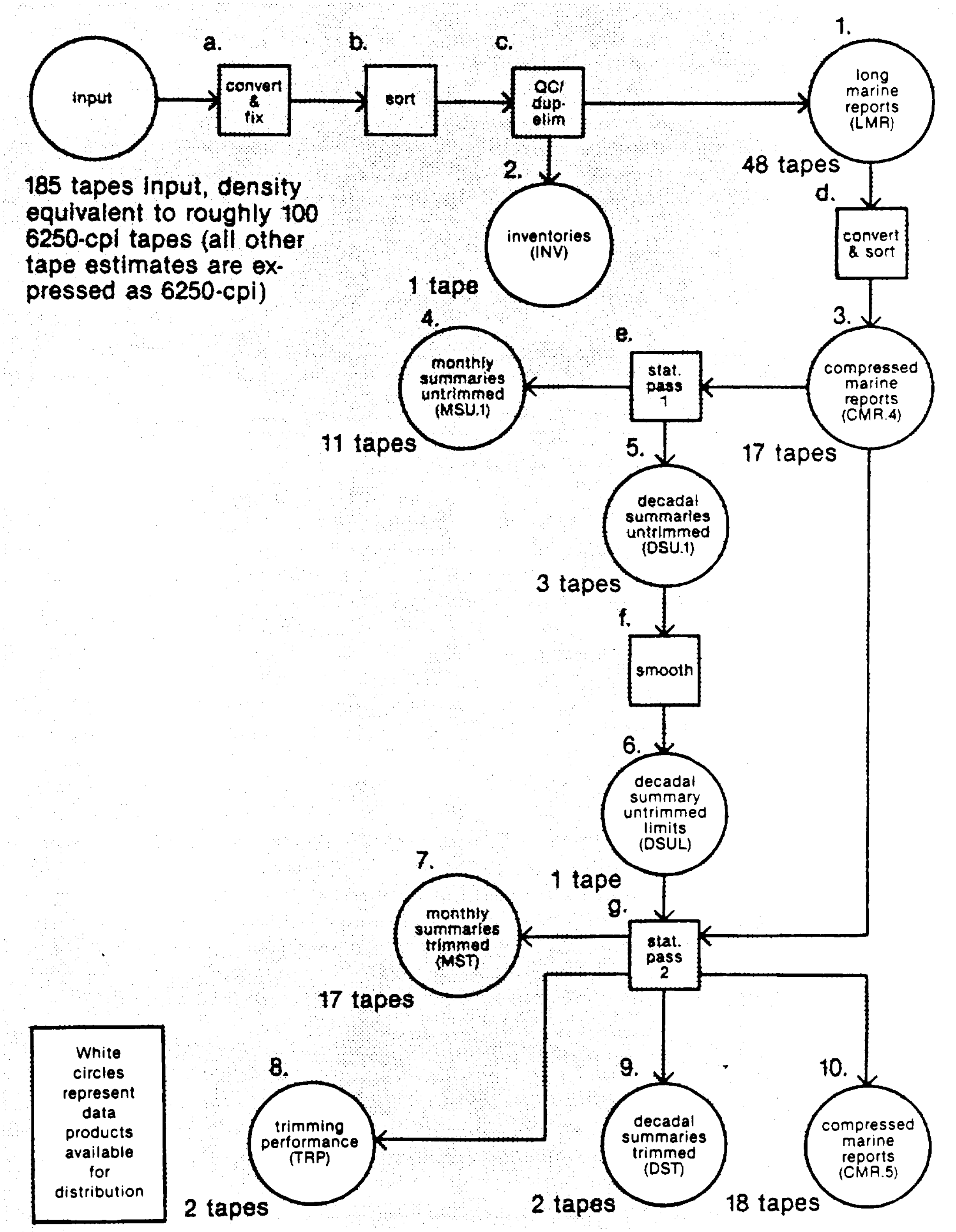
The primary processing yielded all of the basic products, but left them in a form that is difficult for the average user to cope with because of size, ordering, and complexity. (The secondary processing seeks to manipulate these into more user–friendly arrangements.) The basic goals of the primary processing were as follows.

1) To compact and modernize the representation and ordering of individual marine reports without loss of information. For a database of this size, traditional character–based representations are extremely wasteful in both storage and processing costs. Conversion to a packed binary representation (process a on Flowchart 1) based on storing positive integers in minimal–length strings of bits was used to halve storage size (product 1 on Flowchart 1). This format was computationally efficient for the processes (b–c) of sorting, quality control, and the elimination of more than one–fourth of the reports as "certain" duplicates. Inventories (product 2) describe the distribution of reports in time and space and their source. The most commonly used portions of each unique report were also re–expressed in an extremely compact form (product 3), with flags added later (product 10) to indicate which observations failed the second (trimming) stage of quality control.

2) To summarize different variables on a monthly scale in 2° boxes. producing traditional and robust statistics for the expected value and standard deviation. as well as centroids of observational location in time and space. A first set of ”untrimmed” statistics (product 4) summarizes observed variables after using flags from the initial quality, control to reject gross errors, but before any further quality control with the untrimmed statistics, or by ignoring the flags on individual observations in product 10, users retain the freedom of applying their own additional quality control). A second set of ”trimmed” statistics (product 7) summarizes observed plus derived variables after further quality control to remove apparent statistical outliers. Trimming performance data (product 8) count observations trimmed from each 2° box and month.

3) In parallel with the monthly summaries, to summarize trimmed and untrimmed data on a decade–month scale in 2° boxes. Decadal summaries (products 5 and 9) may not be the ”best” representatives of a decade, because of temporal inhomogeneity, but they contain statistics (such as the true decadal median) that cannot be generated from the monthly summaries. Smoothed aggregates of the untrimmed decadal summaries (product 6) were used for limits on which to perform the trimming.

The processes used to meet these goals and the products that result are shown in Flowchart 1, and described individually as follows. All the primary products are stored in packed binary formats, except that product 1 (Long Marine Reports) has a hybrid format consisting of packed binary plus characters.



Flowchart 1. Primary Processing. Data products are shown as circles and processes are shown as squares. (Note: product 3 has been superseded by product 10, and products 4, 5, and 7 have been superseded by secondary products 12-18 shown on Flowchart 2.)

2.1.1 Primary Products (Flowchart 1)

Product 1. (Avail.) Long Marine Reports (LMR*).

This is the format for individual reports output from processes a through c. LMR contain the complete observational record, including quality flags, illegal characters, and supplemental fields, stored in a variable-length format (refer to supp. F) averaging one-half the size of the less complete 148 (8-bit) character NCDC result (TD-1129). Sort is by 10° box, year, month, 1° box, day, hour, and card deck, and possible duplicates have either been eliminated or flagged. Coverage: 1800-1969, 1970-1979 separately; landlocked reports are flagged.

* A shorthand notation is followed to delineate the different versions of a format. Let a.nb denote the full name of a format, where "a" represents an alphabetic string (one or more letters), separated by a period from a numeric string "n" (one or more digits), followed by another alphabetic string "b" which may be empty (zero or more letters) Each of these different strings has a particular usage: "a" is a mnemonic for the format (e.g., MSLI stands for Monthly Summaries 'Untrimmed), "n" is the version number (MSU.2), and "b" is added when the original sort order has been changed (in MSU.2B, B stands for boxsort). In practice, the ".nb", the ".", or the "n" may be omitted where the full name is indicated elsewhere.

Product 2. (Avail.) Inventories (INV).

Includes the number of individual LMR in each year-month and 10° box, as well as summary information giving (approximate) quality-control flag counts and the makeup of each 10° box by card deck and source (supp. K). Sort is by 10° box. Coverage: 1800-1969, 1970-1979 separately; landlocked reports are included.

Product 3. Compressed Marine Reports (CMR.4).

This format for individual reports contains 29 frequently used elements (see supp. E). Sort is by 10° box, month, 2° box, year, day, hour, longitude, latitude. Coverage: 1800-1969, 1970-1979 separately; landlocked reports are included. It has been superseded by product 10.

Product 4. Monthly Summaries Untrimmed (MSU.1).

Eight observed variables, each described by 14 statistics for 2° boxes. Sort is by 10° box, month, 2° box, year. Coverage: 1800-1969, 1970-1979 separately; landlocked data are included. Secondary products 13, 14, and 17 are available instead.

Product 5. Decadal Summaries Untrimmed (DSU.1).

Input to the smoothing process used to create the statistical basis for trimming outliers (product 6). Sort is by 10° box, month, 2° box, decade. Coverage: 1800–1969, 1970–1979 separately; landlocked data are included. It has been superseded by product 12.

Product 6. (Avail.) Decadal Summary Untrimmed Limits (DSUL).

Possibly asymmetric upper and lower limits about a smoothed median were constructed from product 5 (supp. C) and used later to trim outliers from three periods (1854–1909, 1910–1949, and 1950–1979). Sort is by 10° box, month, 2° box, period. Coverage: 1854–1979; landlocked 2° boxes are flagged.

Product 7. Monthly Summaries Trimmed (MST).

Nineteen observed and derived variables, each described by 14 statistics for 2° boxes (supp. A). Sort is by 10° box, month, 2° box, year. Coverage: 1854–1969, 1970–1949 separately; landlocked data are deleted. Secondary products 15, 16, and 18 are available instead.

Product 8. (Avail.) Trimming Performance (TRP).

Gives information (see supp. C) for each 2° box and year-month of the number of explicitly trimmed variables found to be above or below the limits set by DSUL. Sort is by 10° box, 2° box, year, month. Coverage: 1854–1979; landlocked data are counted.

Product 9. (Avail.) Decadal Summaries Trimmed (DST).

Seven variables, each described by 10 statistics (plus sums of squares and cross products of vector wind) for 2° boxes, with the format as given in supp. A . Sort is by 10° box, month, 2° box, decade. Coverage: 1854–1969, 1970–1979 separately; landlocked data are deleted.

Product 10. (Avail.) Compressed Marine Reports (CMR.5).

This format for individual reports contains 28 frequently used elements, and supersedes product 3 as an extremely compact alternative to LMR. Individual ship number or call sign is omitted, as are wave and swell fields, etc. During statistics pass 2 (process g), variables outside 2.8 or 3.5 (trimmed from statistics) estimated standard-deviations about a smoothed median were retained but flagged in a fixed-length format (shown in supp. D) totalling one-sixth the size of the 148 (8-bit) character NCDC result (product 19). Sort is by 10° box, month, 2° box, year, day, hour, longitude, latitude. Coverage: 1854–1969, 1970–1979 separately; landlocked reports are flagged.

2.1.2 Primary Processes (Flowchart 1)

Process a. Convert and Fix
These programs converted from a variety of tape formats and report formats into LMR. Numerous corrections and consistency checks were made. Supp. I gives details for process a.

Process b. Sort
Input data as received were sorted in many different ways. This step sorted all data into the sequence necessary for duplicate elimination (10° box, year, month, 1° box, day, hour, and card deck).

Process c. QC/dupelim
The data were first quality controlled, and the resulting flags used to select the best report in the event of duplicates. Duplicate elimination was complicated by the fact that duplicates were frequently found across hours or days. These steps were coded according to NCDC specifications as shown by supps. J and K .

Process d. Convert and Sort
This converted LMR into CMR.4; supp. E contains translation details. The sort required by the statistics programs has "month" as the first key after "10° box" in order that monthly and decadal statistics could be generated simultaneously.

Process e. Statistics Pass 1
Using as input CMR.4, this produced both 2° monthly and decadal statistics (refer to supps. A –C).

Process f. Smooth
DSU.1 resulting from Pass 1 were smoothed in order to provide limits for trimming. Lineprinter plotting and hand analysis of areas such as coastlines were required to ensure proper smoothing (see supp. C).

Process g. Statistics Pass 2
Using as input CMR.4 and DSUL, this produced trimmed 2° monthly and decadal summaries, plus CMR.5 for those who wish to compute their own statistics using a clean observation set. Supps. A –C show computational details.

2.2 Secondary Processing: Flowchart 2

The products from the primary processing were individual reports, decadal summaries, and monthly summaries in a sort by 10° box, month, 2°

box, year. This sort is acceptable for analyses in limited areas, but is inconvenient and costly when used for delineating global conditions at specific times. Similarly, the files at this stage contain many different statistics and climate variables in each record, and most analyses use only a few quantities at a time. Therefore, additional work was needed to make the data economical to access, and to bring the entire matrix of monthly summary output, over 9.2 billion pieces of information on 26 6250–cpi tapes, within easy reach of the individual investigator. Procedures were as follows.

1) The monthly summaries were sorted into the "timesort" of products 13 and 15 shown on Flowchart 2. The time (or synoptic) sort, by pure time (January 1855 follows December 1854, etc.) and then 2° box, permits analysis of the globe at each time step, in sequence. A "boxsort", by 2° box and then pure time within each 10° box, was completed (products 14 and 16) for studies that concentrate on a small area. The untrimmed monthly and decadal summaries also were reformatted in order to make the formats of products 11 and 12 compatible with their trimmed counterparts, and to achieve a significant (about 15%) reduction in size.

2) The monthly summaries in timesort were separated into group files so it would not be necessary to pass over unwanted data. Typically, studies will require grouping mean–estimates of a variable together with the number of observations. a standard deviation estimate, and centroids of observational location in time and space, so that smoothed grids might be generated taking into account all the different aspects of variability. The group riles combine four such variable–ensembles, and serve as the primary exchange format (products 17 and 18). For some selected values of very common use. such as the mean of sea surface temperature, individual files may later be generated.

3) With major work by NCAR the individual reports were converted into NCDCs Standard character format (product 19). Because of the large computing requirements, it was important that the very complex transformation be properly generated. Therefore. sample tapes were sent to NCDC to be checked.

Flowchart 2 shows the secondary products and processes, as described individual, in the following. All the secondary products are stored in packed binary formats, except that product 19 (TD– 1129) has an ordinary character format.

2.2.1 Secondary Products (Flowchart 2)

Product 11. Monthly Summaries Untrimmed (MSU).

Eight observed variables. each described by 14 statistics for 2° boxes, with the format as given in supp. A (this carries essentially the same information as product 4, but in a more efficient format compatible with that of its trimmed counterpart, product 7). Sort is by 10° box, month, 2° box, year. Coverage: 1854–1969, 1970–1979 separately; landlocked data are included. Products 13, 14, and 17 are available instead.

Product 12. (Avail.) Decadal Summaries Untrimmed (DSU).

Six variables, each described by eight statistics (plus sums of squares and cross products of vector wind) for 2° boxes, with the format as given in supp. A (this carries essentially the same information as product 5, but in a more efficient format similar to that of its trimmed counterpart, product 9). Sort is by 10° box, month, 2° box, decade. Coverage: 1854–1969, 1970–1979 separately landlocked data are included.

Product 13. (Avail.) Monthly Summaries Untrimmed Timesort (MSU.T).

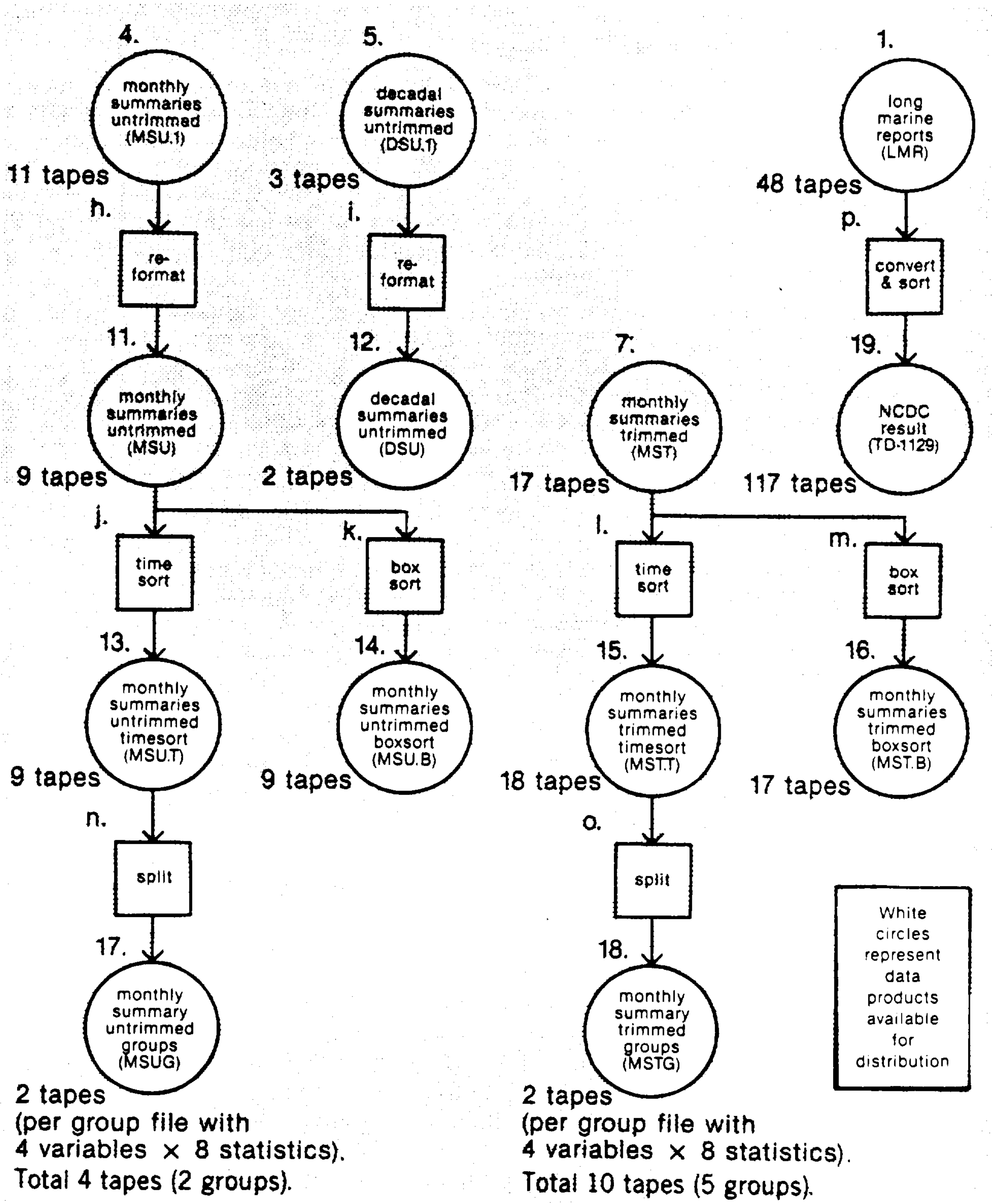
Eight observed variables, each described by 14 statistics for 2° boxes, with the format as given in supp. A . Sort is by year, month, 2° box (also called synoptic sort). Coverage: 1854–1979 landlocked data are included.

Product 14. (Avail.) Monthly Summaries Untrimmed Boxsort (MSU.B).

This is product 13, sorted instead by 10° box, 2° box, year, month. Coverage: 1854–1979; landlocked data are included.

Product 15. (Avail.) Monthly Summaries Trimmed Timesort (MST.T).

Nineteen observed and derived variables, each described by 14 statistics for 2° boxes, with the format as given in supp. A . Sort is by year, month, 2° box (also called synoptic sort). Coverage: 1854–1979; landlocked data are deleted.



Flowchart 2. Secondary Processing. Data products are shown as circles and processes are shown as squares.

Product 16. (Avail.) Monthly Summaries Trimmed Boxsort (MST.B).

This is product 15, sorted instead by 10° box, 2° box, year, month. Coverage: 1854–1979; landlocked data are deleted.

Product 17. (Avail.) Monthly Summary Untrimmed Groups (MSUG) and

Product 18. (Avail.) Monthly Summary Trimmed Groups (MSTG).

These files (described in supp. B) are intended as a manageable alternative to the timesort files, in terms of processing and storage costs, for studies using only a few variables and statistics. Sort is by year, month, 2° box (also called synoptic sort). Coverage: 1854–1979; landlocked data are deleted.

The two untrimmed groups (numbered 1–2) and the five trimmed groups (numbered 3–7) each contain four variables, with eight statistics included for each variable. For example, group 3 contains these statistics:

median
mean
number of observations
standard deviation estimate: (fifth–first sextile)/2
mean day–of–month of observations hour statistic
mean longitude of observations
mean latitude of observations

for these variables:

sea surface temperature
air temperature
specific humidity
relative humidity

Group 4 contains the same statistics for these variables:

scalar wind
vector wind eastward component
vector wind northward component
sea level pressure

Product 19. (Avail.) NCDC Result (TD–1129).

A subset of the full observational record in LMR is now available for distribution by NCDC in its TD–1129 ascii–character format. This is a 148–character format (see supp. I) sorted by Marsden Square, year, month, 1° Marsden Square, day, hour, card deck. (NCDC plans to re–sort this by Marsden Square, 1° Marsden Square, year, month, day, hour.) Coverage: 1800–1969, 1970–1979 separately; landlocked data are flagged.

2.2.2 Secondary Processes (Flowchart 2)

Processes h. and i. Reformat
These two steps compressed the identification fields. The same bit manipulations can now extract them out from any summary, whether decadal or monthly.
Processes j. and l. Time Sort
The monthly summaries were sorted by year–month and then 2° box.
Processes k. and m. Box Sort
The monthly summaries were sorted by 2° box and then year–month, within each 10° box. Contrast this with the sort of products 7 and 11.
Processes n. and o. Split
The complete monthly summary matrices (untrimmed 8 variables x 14 statistics, trimmed 19 variables x 14 statistics) were split up into group files (4 variables x 8 statistics). In this process, the centroids of time/space location were shortened in length and precision (as given in supp. B).
Process p. Convert and Sort
This converts LMR back to TD–1129 for NCDC. A sort is required in order to change the first key from ″10° box″ to ″Marsden Square.″

3. Data Output

Results here show characteristics of the data at various stages, primarily after process c (QC/dupelim). Except for the summaries output from process g (statistics pass 2) and their derivatives, these results also include substantial amounts of data over land that were removed only at later stages of processing. For example, only two 10° boxes in the 1970s have no apparent data.

Table 3–1a lists the number of product records output from various processes; Tables 3–1b and 3–1c give related percentages. The precise definition of ″certain″ and ″uncertain″ duplicates (dups) is given by supp. K – – but it will suffice at this stage to allude to the degree of certainty in correctly identifying dups, with the ″uncertain″ being retained with flags in the LMR output, and removed from the TD–1129. The 1970s output is tabulated separately in each case, even if it was not run separately.

Table 3–1a
Process Outputs

Process	Output	Pre–'70s	'70s	Total
b. [a] sort	LMR	74,633,905	23,817,437	98,451,342[b]
c. QC/dupelim	1.[a] LMR (total)	53,185,975	18,682,484	71,868,459
	1. LMR (uncertain)	329,233	57,825	387,058
g. statistics pass 2	8. TRP	3,699,340	833,847	4,533,187
	9. DST	765,745[c]	102,463[c]	868,208[c]
	10. CMR.5	52,840,447	18,622,039	71,462,486
i. reformat	12. DSU	776,543	128,122	904,665
j. time sort	13. MSU.T	3,680,781	788,866	4,469,647
k. box sort	14. MSU.B	3,680,781	788,866	4,469,647
l. time sort	15. MST.T	3,685,123[c]	785,223[c]	4,470,346[c]
m. box sort	16. MST.B	3,685,123	785,223	4,470,346
n. split	17. MSUG (each group)	3,680,781	788,866	4,469,647
o. split	18. MSTG (each group)	3,685,123	785,223	4,470,346
p. convert and sort	19. TD–1129	52,856,742	18,624,659	71,481,401

[a] Letters and numbers refer to Flowchart 1 and 2 (LMR output from process b was an intermediate product).

[b] The discrepancy between the total from process b and that given in Table 1–1 is largely because of the removal of seriously defective or mis–sorted reports prior to this stage.

[c] It is thought that deletion of land data mainly accounts for the drop in the number of DST in comparison to DSU, but that inclusion of Monterey Telecom. (card deck 555) data on))– in the trimmed summaries more or less compensates for this effect in the number of MST in comparison to MSU. Supp. A has details on these and other criteria governing summary output.

Table 3–1b
Duplication Percentages

Percentage of process output	Pre–70s	'70s	Total
percentage of b duplicate (certain + uncertain)	29	22	27
percentage of c uncertain	1	0.3	1

Table 3–1c
Process b and c Output Percentages by Source

Source*	Pre–'70s b	Pre–'70s c	'70s b	'70s c	Total b	Total c
GTS	3	3	37	46	11	14
non–GTS	97	97	63	54	89	86
Buoy	0	0	2	2	1	0.5
IMMPC	21	25	58	50	30	32
NODC	2	3	1	2	2	2
HSST	34	16	0	0	26	12

* Global telecommunication system (GTS) data were identified by card deck (see supp. F): 555, 666, 849, 850, 889, 889, 999. Non–GTS data comprise all other card decks, as well as identifiable data from the remaining categories: buoy decks 143, 876–882; IMMPC 128, 926–928; NODC 891; and HSST 150–156.

Figure 3–1 gives a curve of global reports by month from the early 1850s through 1979. Except for 50 suspect reports in 1800–1807, the area under this curve corresponds to the total from process c in Table 3–1a . Breaking the globe up into four somewhat arbitrary basins according to Figure 3–2 gives the set of curves shown by Figures 3–3 through 3–6 . Of course these curves show nothing about variations in the spatial density within each area (see Figures 3–8 through 3–21 , and Table 3–2), but can be used as a rough gauge of the temporal reliability of any conclusion drawn over such a large area.

The highest curve in Figure 3–7 is like that of Figure 3–1 , but shows global reports per year rather than per month. Underneath are two curves of global reports per year input to dupelim: 1) from NCDC's Atlas data set, extended for 1970–1979 using their '70s Decade data set and 2) from the HSST data set. These three data sets are the largest inputs to COADS, and significant data sets scientifically.

Figure 3–8 is a map showing, for each 10° box, the $\log_{10}$ of reports output from dupelim, summed for all months from 1854 through 1979. The $\log_{10}$ is blank only for a box containing no data whatsoever, i.e., box 638. Figures 3–9 through 3–21 are similar maps for decades (starting with the fractional decade 1854–1859, then 1860–1869, etc.). Note the increase through time of data over land, especially for the 1960s and 1970s. This is coincident with when the global telecommunication system (GTS) starts, but is at least partly an artifact of previous editing procedures that removed earlier land data.

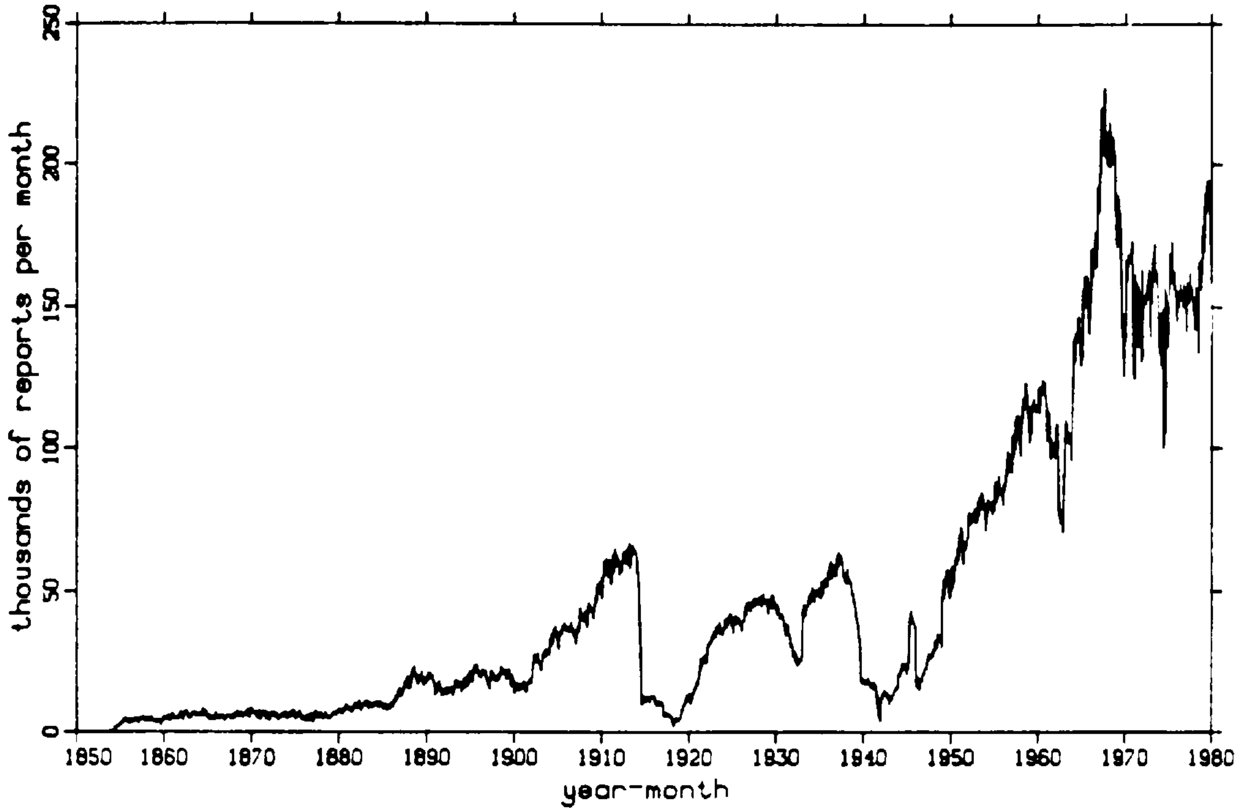


Figure 3-1. Global reports after duplicate elimination.

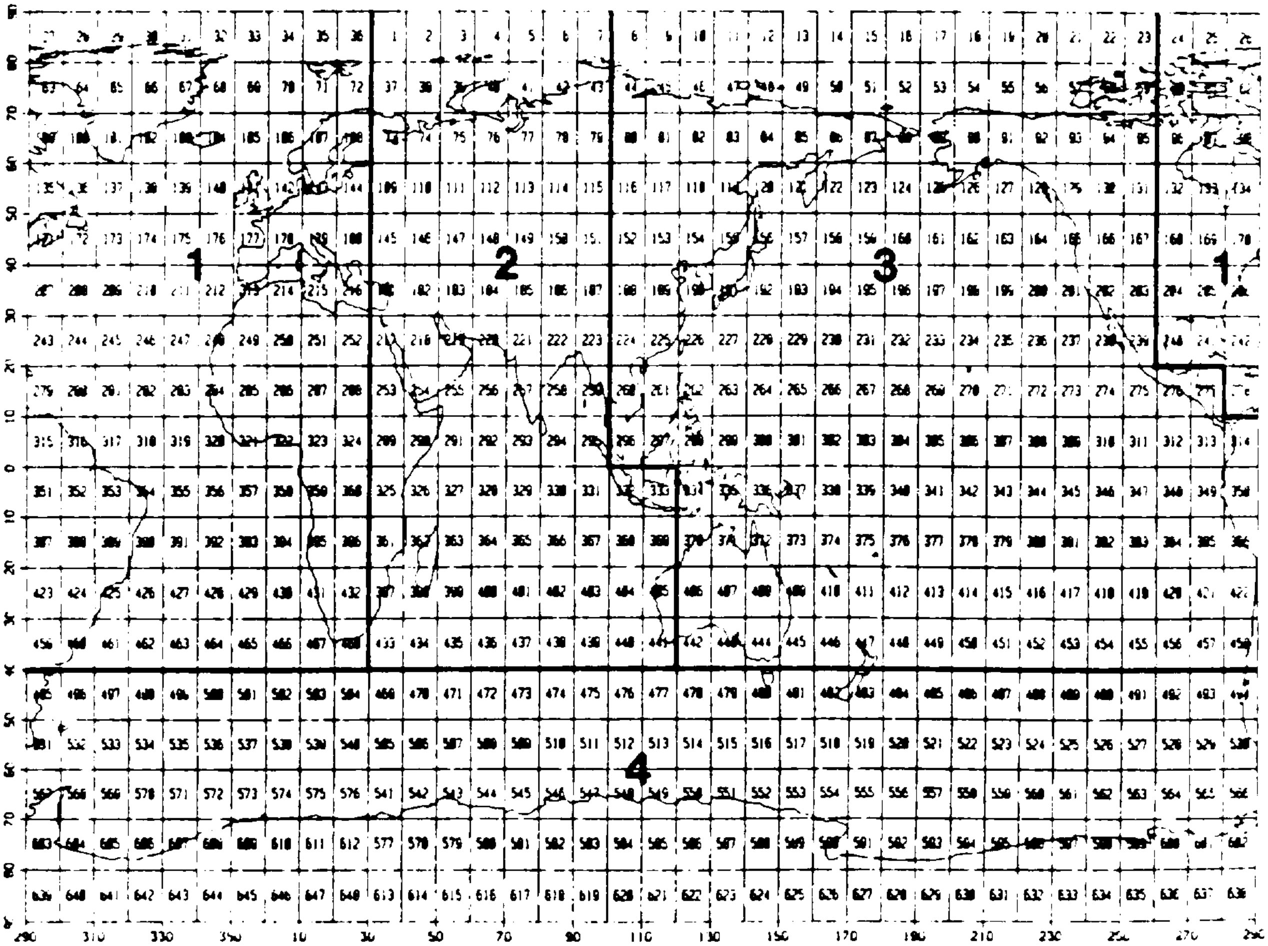


Figure 3-2. Basins and 10° boxes.

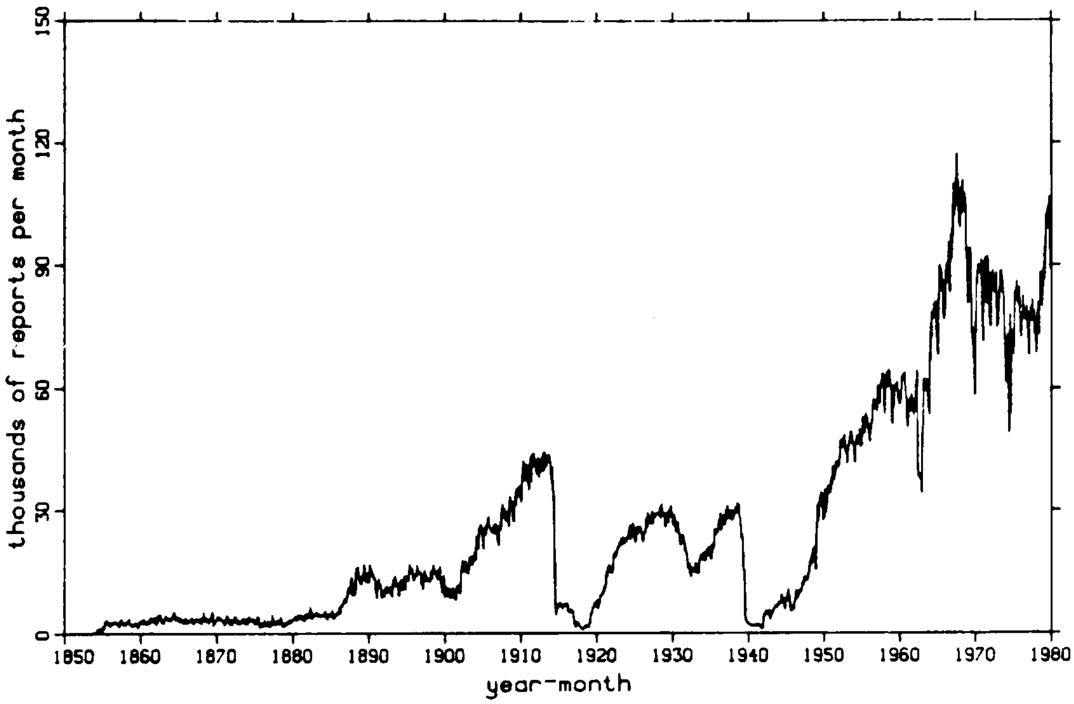


Figure 3-3. Basin 1 ATLANTIC reports after duplicate elimination.

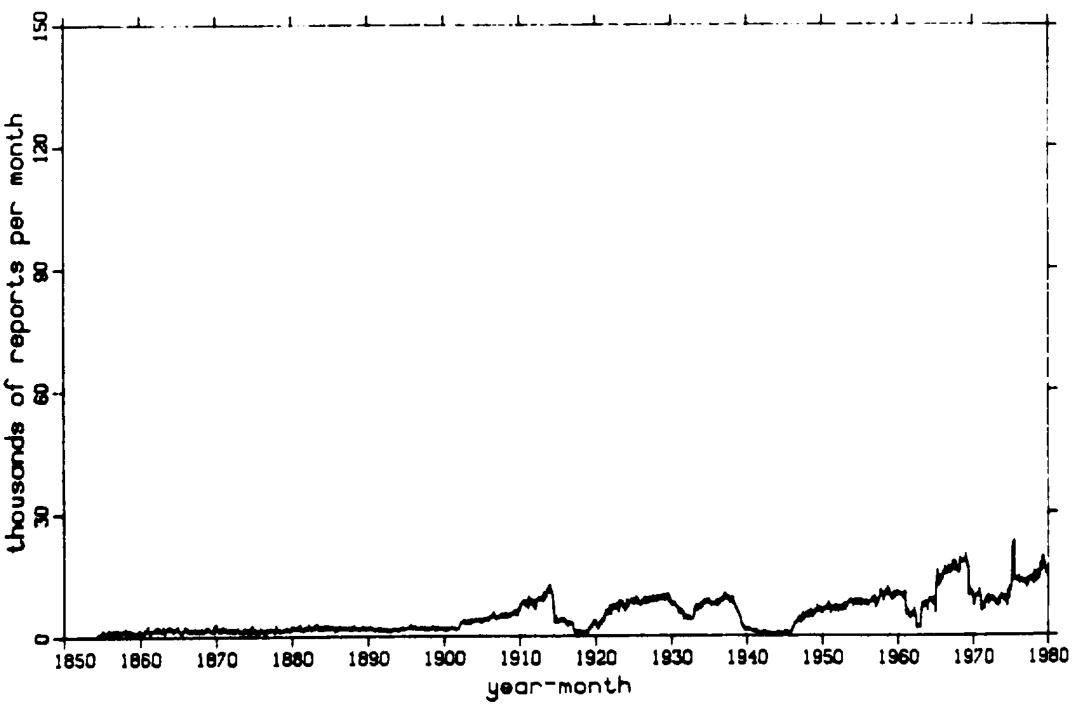


Figure 3-4. Basin 2 INDIAN reports after duplicate elimination.

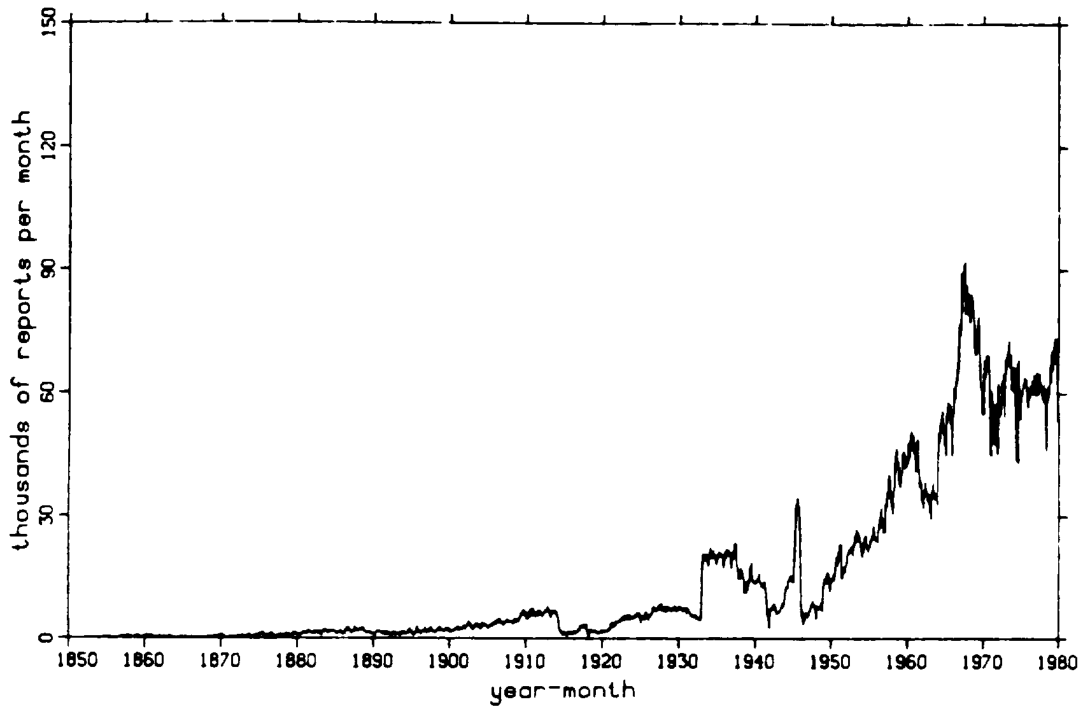


Figure 3-5. Basin 3 PACIFIC reports after duplicate elimination.

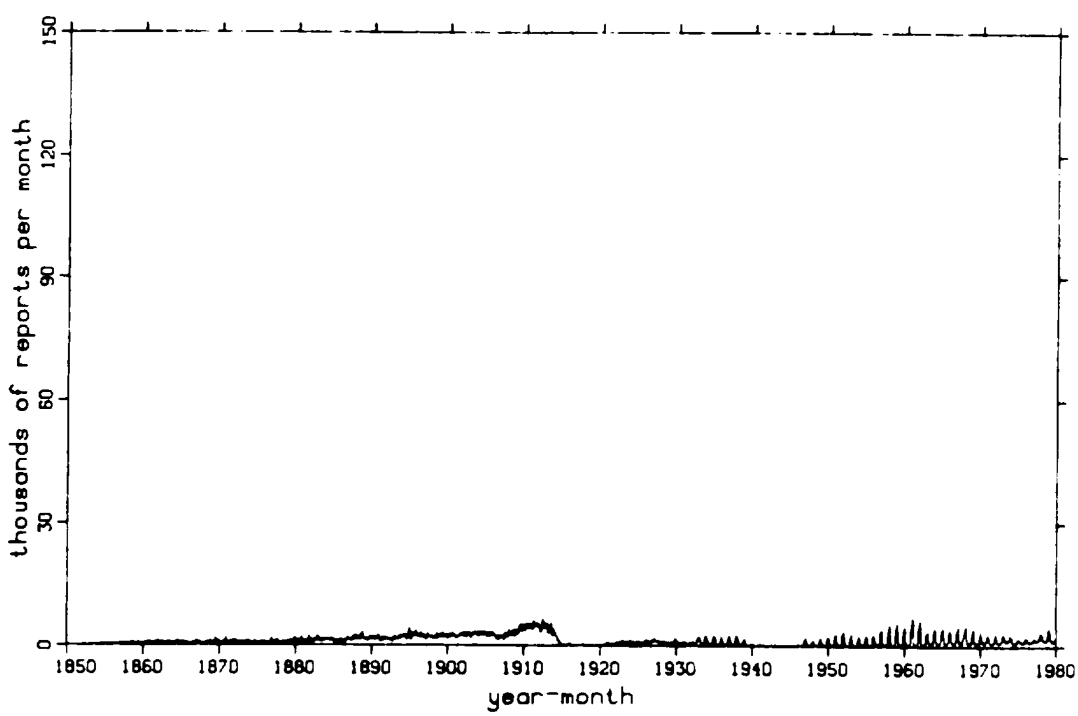


Figure 3-6. Basin 4 ANTARCTIC reports after duplicate elimination.

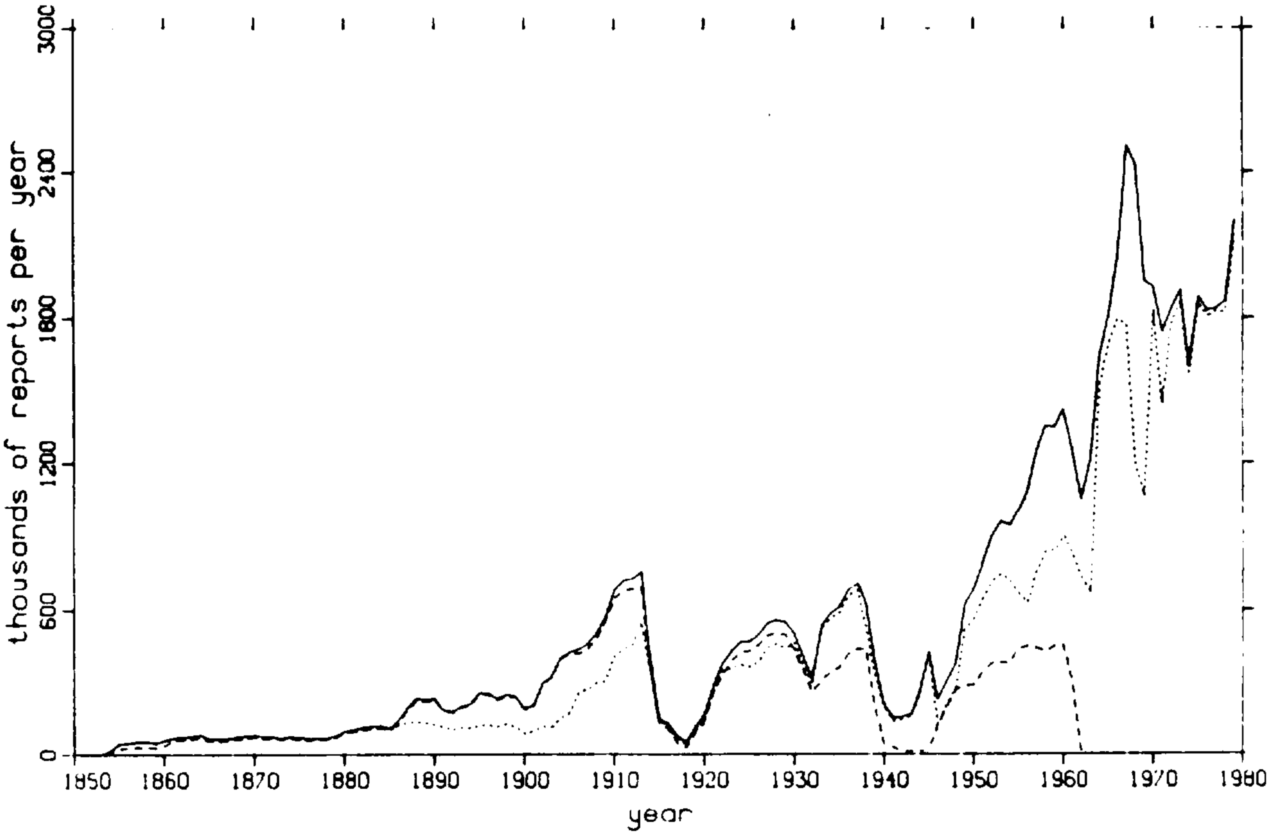


Figure 3-7. Annual global reports after duplicate elimination (solid); Atlas input (dotted, through 1969) continued by '70s Decade (dotted, 1970-1979); and HSST input (dashed, through 1961).

Table 3–2 is a frequency distribution of the number of untrimmed monthly summaries (i.e., year–month–2° boxes) having different counts of sea surface temperature observations for statistics. These are given for four different 10° boxes (see Figure 3–2), for the ’70s decade. As one goes back in time, more of the boxes will have fewer observations.

Table 3–2
Frequency Distribution of Untrimmed Monthly Summaries

Observations of sea surface temperature	10° box			
	163 (Gulf of Alaska)	176 (Spanish Coast)	420 (N. Chile)	438 (S. Indian Ocean)
1	3	1	553	745
2	14	3	210	553
3	20	8	76	336
4	41	2	33	216
5	49	10	18	157
6	61	14	7	81
7	96	21	3	62
8	96	15	1	39
9	101	19	3	30
10–99	2519	2349	1	39
100–999	0	557	0	0
>999	0	0	0	0

Table 3–3 gives, for different variables and time periods, the number of observations input to process g (statistics pass 2); the percentage of those observations trimmed, and thus excluded from the monthly and decadal summaries; and an estimate of the percentage of those observations that might be mislocated, assuming the number on approximate land locations (counted separately) was representative of the mislocation rate over water. Refer to supp. C for more information on the trimming process.

Table 3–3
Trimming Performance Summary

	Period	S	A	U and V	P	R
input (million observations)	pre–'70s	47.19	50.15	50.88	37.09	23.09
	'70s	16.06	17.90	17.79	17.55	13.59
	total	63.25	68.05	68.67	54.65	36.68
percentage trimmed	pre–'70s	1.24	0.92	1.61	0.65	0.26*
	'70s	2.28	1.46	1.39	0.92	0.43
	total	1.51	1.06	1.56	0.74	0.32
percentage mislocated (est.)	pre–'70s	0.05	0.07	0.09	0.12	n/a
	'70s	1.21	1.26	1.26	1.28	n/a
	total	0.35	0.38	0.40	0.49	n/a

* One condition required before relative humidity R could be computed was that air temperature A not be trimmed; this is the percentage of R (only) trimmed afterwards.

Table 3–4 shows blocking factors chosen for writing out different formats onto 6250–cpi tape. Whenever convenient, block sizes were chosen to be evenly divisible by 60 or 64 bits, and as large as possible but less than or equal to 29,760 bits (i.e., 496*60 or 465*64 bits). These constraints are based on the efficient capabilities of a wide variety of computers currently in use.

Table 3-4
Default 6250-cpi Blocking of Products

Gbit[a]	Tapes	Product	Record length (bits)	Blocked	Block size (bits)	60-bit words	64-bit words	Record count
39.5	48	1. LMR	549[b]	169[c]	64,000[c]	1,066.7	1,000	71,868,459
0.089	1	2. INV	69,294[b]	1	198,240[c]	3,304	3,097.5	1,285[d]
13.7	17[e]	3. CMR.4	192	150	28,800	480	450	71,462,542
8.58	11[e]	4. MSU.1	1,920	15	28,800	480	450	4,469,669
0.868	3	5. DSU.1	960	30	28,800	480	450	904,687
0.224	1	6. DSUL	384	75	28,800	480	450	583,272[f]
16.6	17[e]	7. MST	3,712[g]	15	55,680	928	870	4,470,346
1.16	2	8. TRP	256	105	26,880	448	420	4,533,187[f]
1.11	2[e]	9. DST	1,280	21	26,880	448	420	868,208
13.7	18	10. CMR.5	192	150	28,800	480	450	71,462,486[f]
7.15	9	11. MSU	1,600	19	30,400	506.7	475	4,469,647
0.868	2	12. DSU	960	30	28,800	480	450	904,665[f]
7.15	9	13. MSU.T	1,600	18	28,800	480	450	4,469,647[f]
7.15	9	14. MSU.B	1,600	18	28,800	480	450	4,469,647[f]
16.6	18	15. MST.T	3,712	15	55,680	928	870	4,470,346[f]
16.6	17	16. MST.B	3,712	15	55,680	928	870	4,470,346[f]
1.72	2	17. MSUG	384	150	57,600	960	900	4,469,647
1.72	2	18. MSTG	384	150	57,600	960	900	4,470,346
84.6	117[h]	19. TD-1129	1,184[i]	70	82,880	1,381.3	1,295	71,481,401

[a] The Gigabit (10^9 bits) is a convenient unit of size because it represents approximately the amount of data that will fit on one 6250-cpi tape.
[b] Actual record length is variable; this is an estimated average.
[c] Actual blocking factor or block size is variable; this is the maximum (found in INV or possible in LMR).
[d] There are 639 and 646 extant 10° boxes in the pre-'70s and '70s, respectively.
[e] The number of TAPES is estimated using FORTRAN (allowing 9-character variable names):

```
IMPLICIT INTEGER(A-Z)
TAPES = ((COUNT - 1) / BLOCKED + 1) * (BLOCKSIZE + 15000) + 648 * 15000
TAPES = (TAPES - 1) / 1300000000 + 1
```

which assumes record gaps and 648 file marks of 15,000 bits each on 2,400 foot 6250-cpi tapes.
[f] Binary-zero records that fill out short blocks are not included in this count or that for Gbit.
[g] Cannot meet the blocking criteria given earlier.
[h] There are 87 tapes for the pre-'70s and 30 estimated for the '70s.
[i] Cannot meet the blocking criteria given earlier, but the divisibility by 60 or 64 bits is less applicable.

4. Cautions

Final cautions for the user: instrumental methods, observational methods, coding methods, ship tracks in time and space, ship construction, data density -- all these have undergone historical changes, the majority of which are unrecorded in the data sets from which COADS has been derived, and so could not be made a part of it.

These inhomogeneities are compounded by the significant percentage of errors that occur at every stage of observation, recording, transmission, and processing.

Whenever possible, flags, indicators, centroids of location, and robust statistics have been provided to signal or alleviate some of these problems. A few known problems should be emphasized (see also supp. K for background on problems in specific data sets):

Bucket Indicators. Sea surface temperatures measured by intake (or injection) have been shown, in earlier work summarized by [9], to be higher by roughly 0.5°C than those measured by bucket. Unfortunately, an explicit indicator for the method used is available only starting in 1968, and only in manuscript data; documentation problems render even this indicator unusable for U.S. recruited ships prior to around May 1973. As was done in the HSST project, many earlier data can be more or less safely categorized as bucket or ”unknown” solely on the basis of historical knowledge about the different card decks. In COADS a flag is included that is set if an individual report came from the HSST set or matches an HSST report. Thus this flag can be used to imply bucket measurement. Together with the somewhat unreliable flag value that directly specifies bucket measurement in later years, this may help users of individual reports to separate bucket from unknown data. However, [1] raised the possibility that some decks included in the HSST were subject to intake contamination. This conclusion was verified to a small extent in dupelim by the discovery of matches between deck 116 (U.S. Merchant Marine intake data) and the HSST. Observations were included in the monthly and decadal summaries without regard to bucket indicators.

Wind Speed. The ”old” Beaufort scale as detailed in supp. K was used to bracket each estimated speed at a value in ms^{-1}. It should be noted that the mixture of speeds estimated first by sail, second by sea state, and later measured, yields potentially inhomogeneous data.

Wind Direction. Similarly, the different compass codes shown in supp. F have been bracketed at a value in whole degrees.

Daytime/Nighttime Observations. [9] discusses the different biases associated with daytime versus nighttime observations. Instead of summarizing separate statistics for day and night •• a task that would probably have doubled already large computing and storage requirements•• the trimmed statistics carry the fraction of observations in approximate daylight, to permit some adjustments.

Ship Type. Considerable effort was devoted to making readily available an existing indicator for type of observing vessel, or attempting to derive it where none was available (see supp. I). Unfortunately, these efforts failed in many cases. Even where they succeeded, the results should be treated with suspicion, because of a lack of adequate past documentation. For instance, many OSV (Ocean Station Vessel) data are not identified as such starting around 1970.

Wave and Swell Fields. These fields were subject to extensive WMO (World Meteorological Organization) code changes effective 1 July 1963 and 1 January 1968, which were not necessarily followed promptly by observers although conversion procedures usually assumed they were. Special caution should be exercised around those dates. Periods of (wind) wave and swell should be considered highly questionable prior to 1968 for internationally exchanged data assigned to card deck 926. This is because conversion procedures assumed data were in the pre-1968 code; but when exchanged years later, they sometimes were digitized according to more recent codes.

Monthly Summaries. Statistics pass 2 (process g) used 3.5 estimated standard deviations about a smoothed median as thresholds for including data in the trimmed monthly summaries. Although Table 3-3 lists considerably more than the 0.04% trimming performance expected from a normal distribution, outliers may still be found, especially in small samples (e.g., < 3 observations). The median and other robust statistics, such as the standard deviation estimate from the first and fifth sextiles (used for establishing trimming limits), are recommended as more robust and outlier-resistant alternatives to the mean and ordinary standard deviation about the mean. It should be noted that no attempt was made to otherwise correct for instrumental or observational biases, such as bucket and intake data or observations at night and day. Also, the relatively noisy Monterey Telecom. data set (card deck 555) was excluded from the untrimmed monthly and decadal summaries, but permitted in the trimmed monthly and decadal summaries after trimming limits had been set.

Some of these problems can be overcome, for studies that seek to detect any slight changes in climate, by recourse to the individual reports. This would be less prohibitive if carried out in limited regions and times containing adequate coverage, in which it might be feasible to discriminate between bucket and intake, night and day, etc.

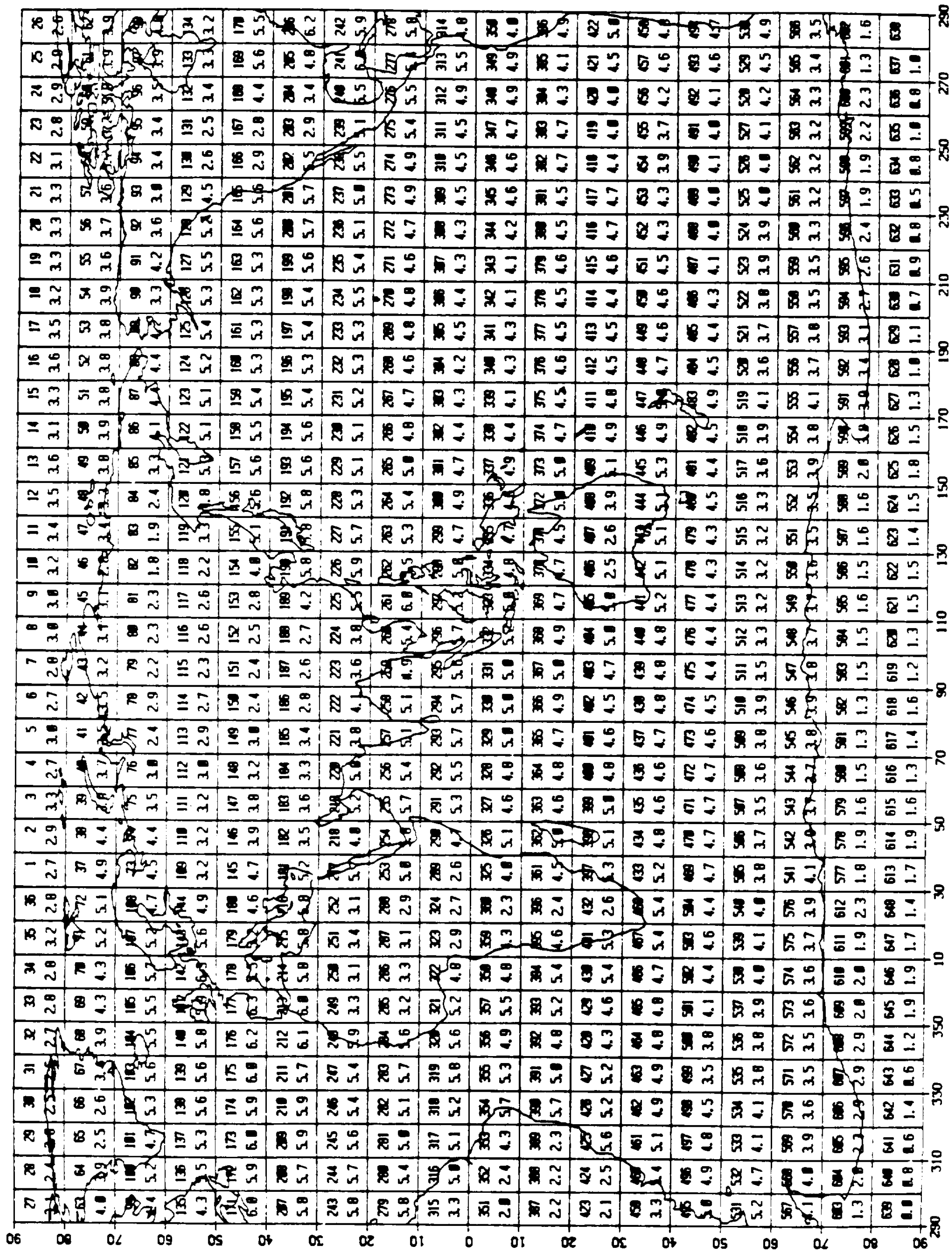


Figure 3-8. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1854-1979 (larger numerals).

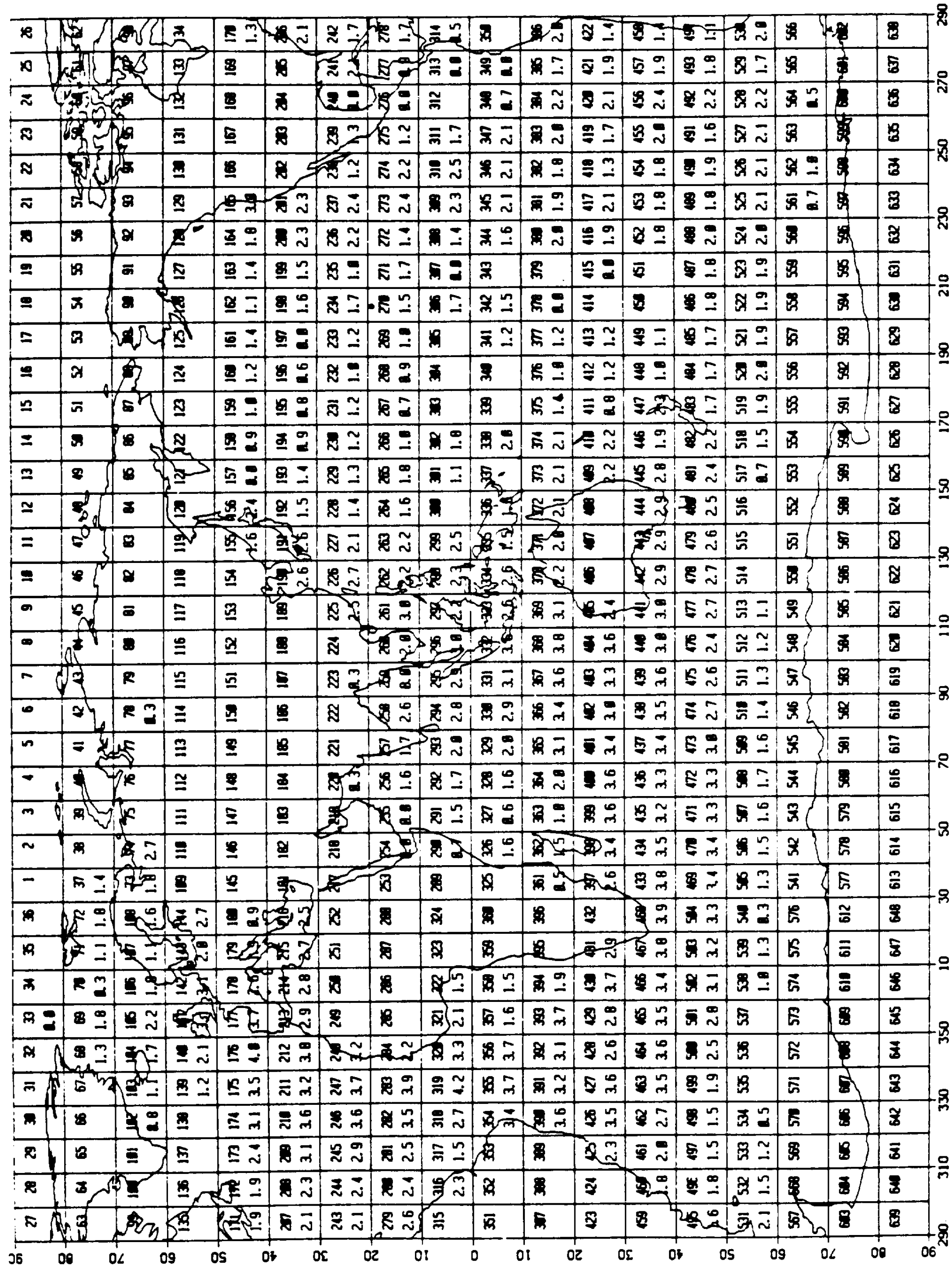


Figure 3-9. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1854-1859 (larger numerals).

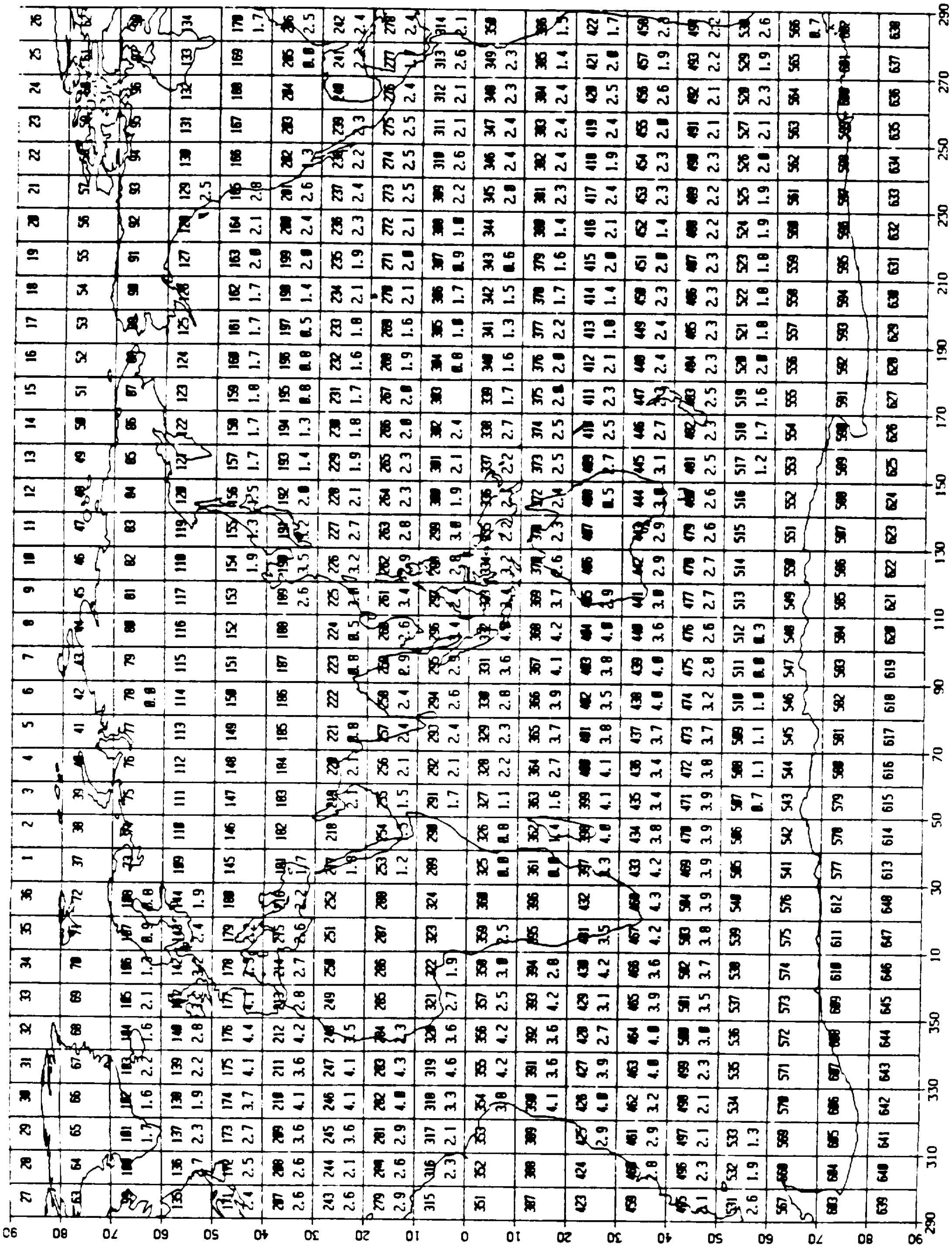


Figure 3-10. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1860-1869 (larger numerals).

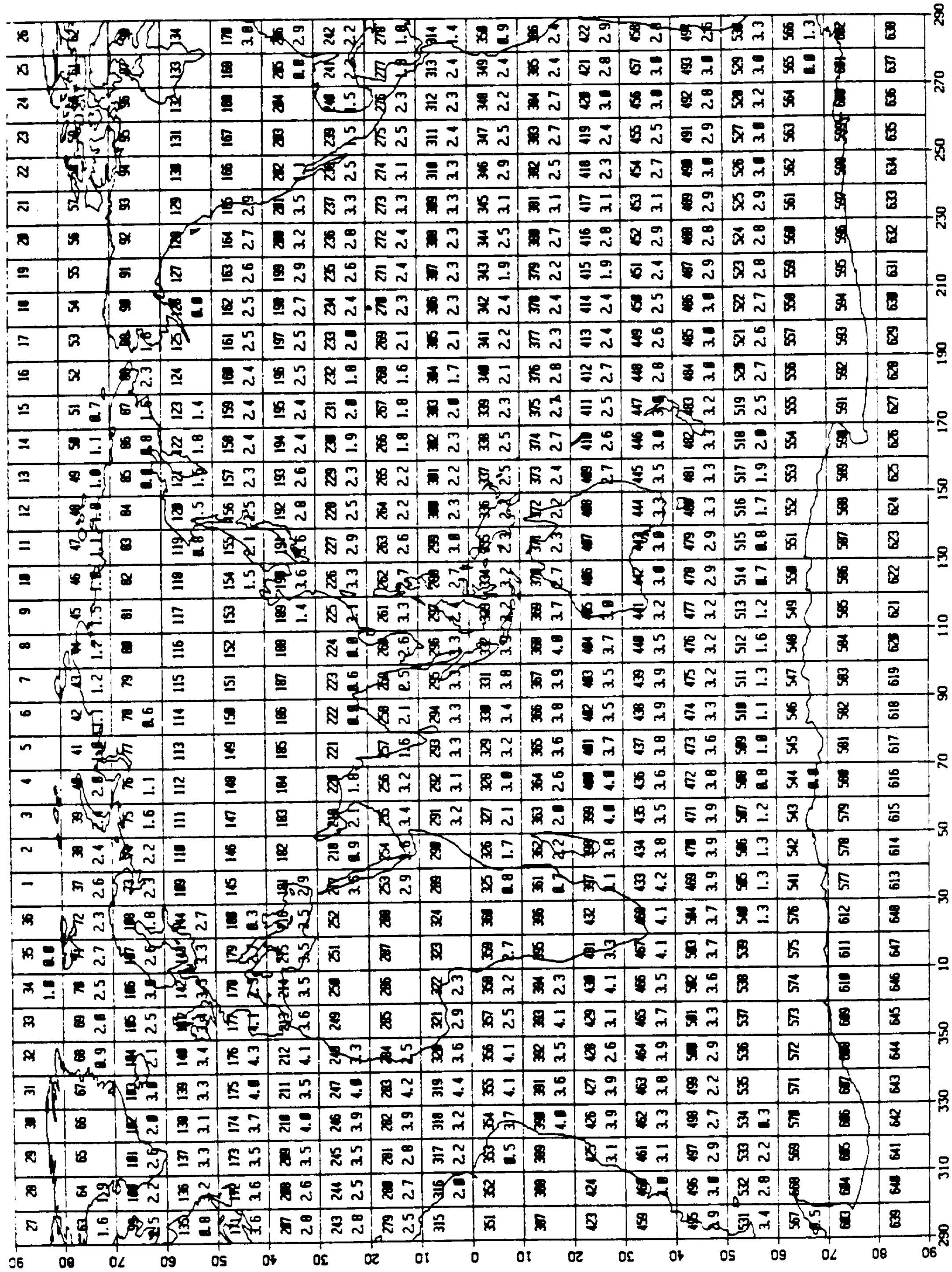


Figure 3-11. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1870-1879 (larger numerals).

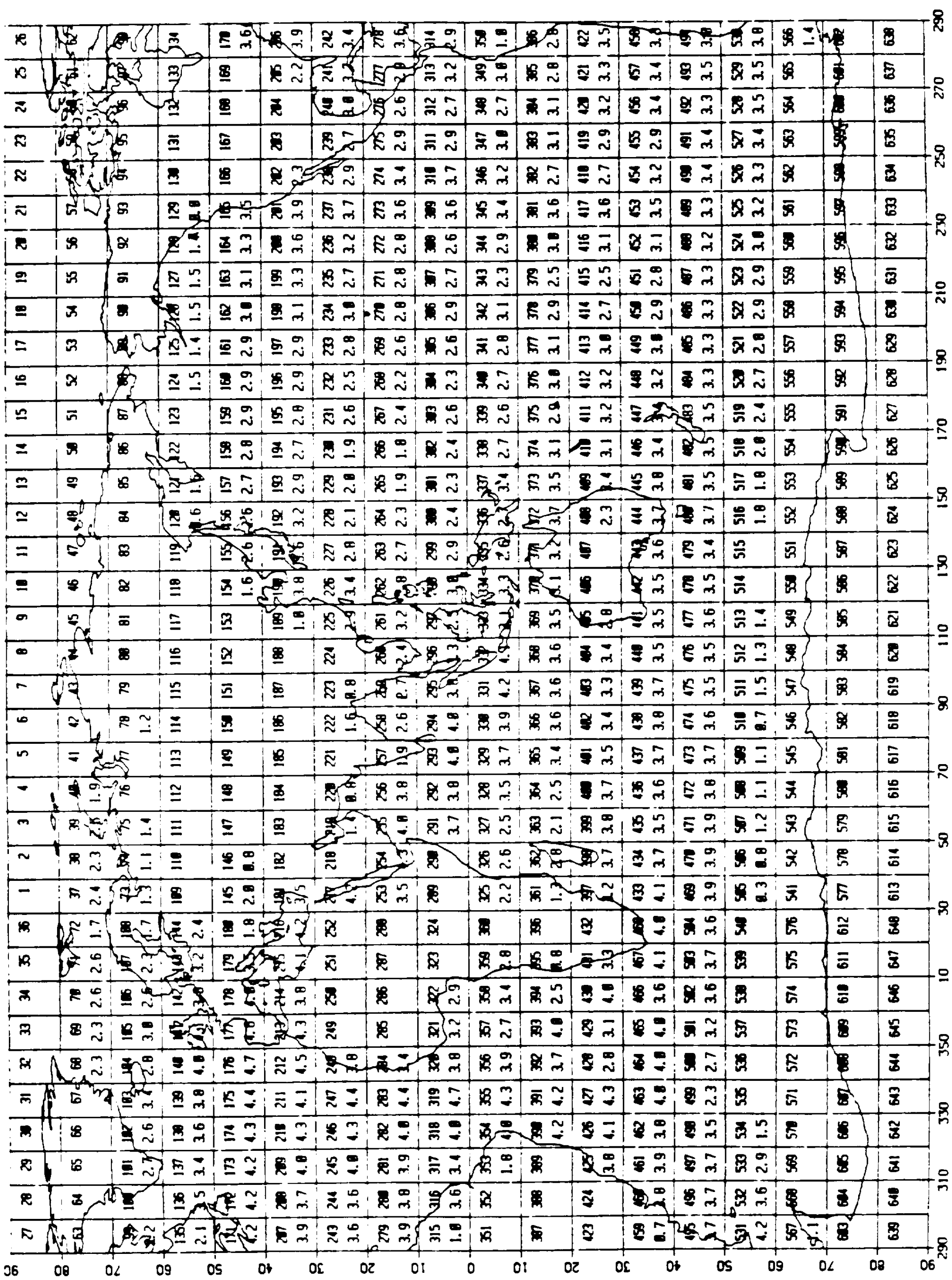


Figure 3-12. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1880-1889 (larger numerals).

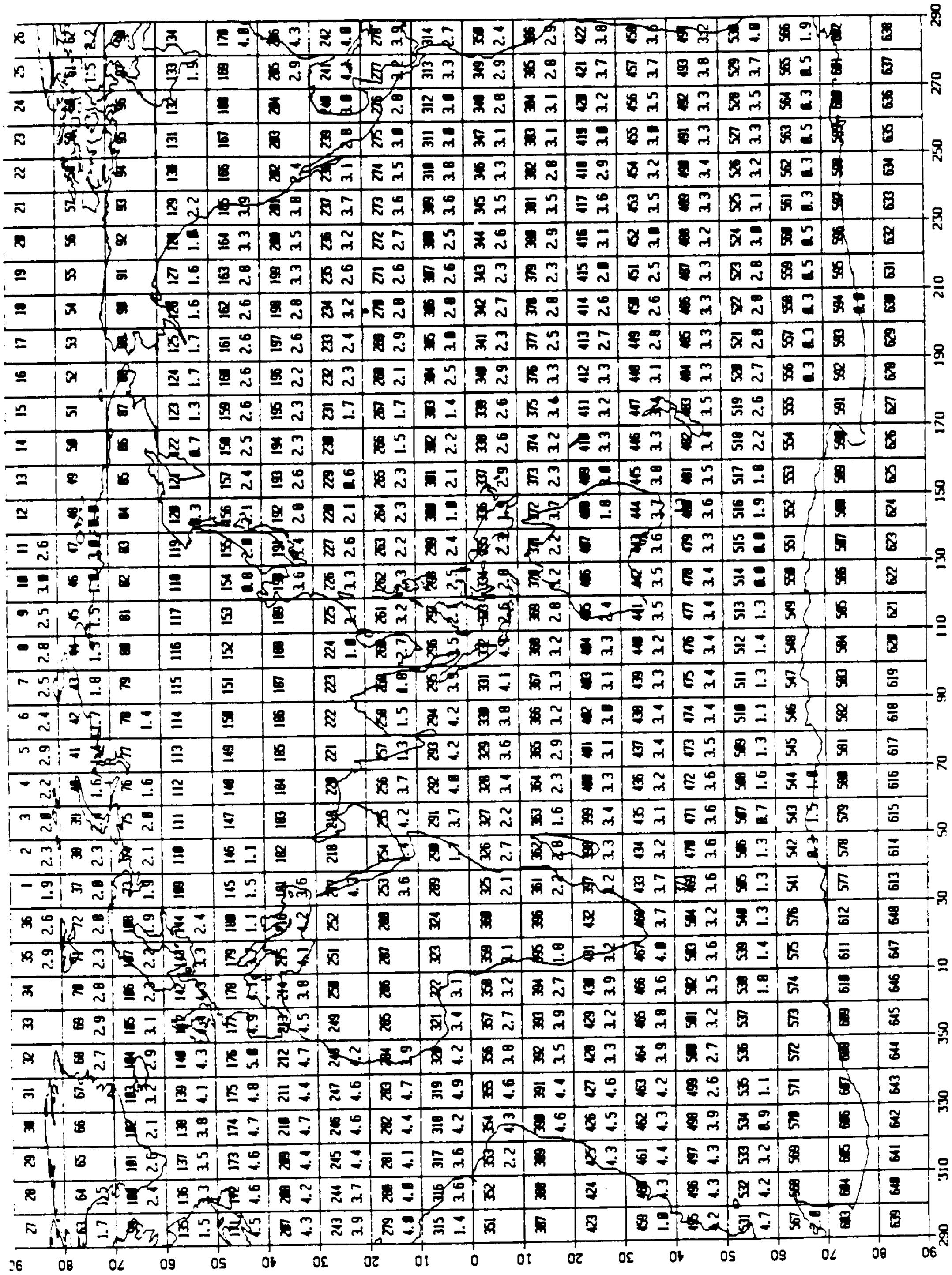


Figure 3-13. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1890-1899 (larger numerals).

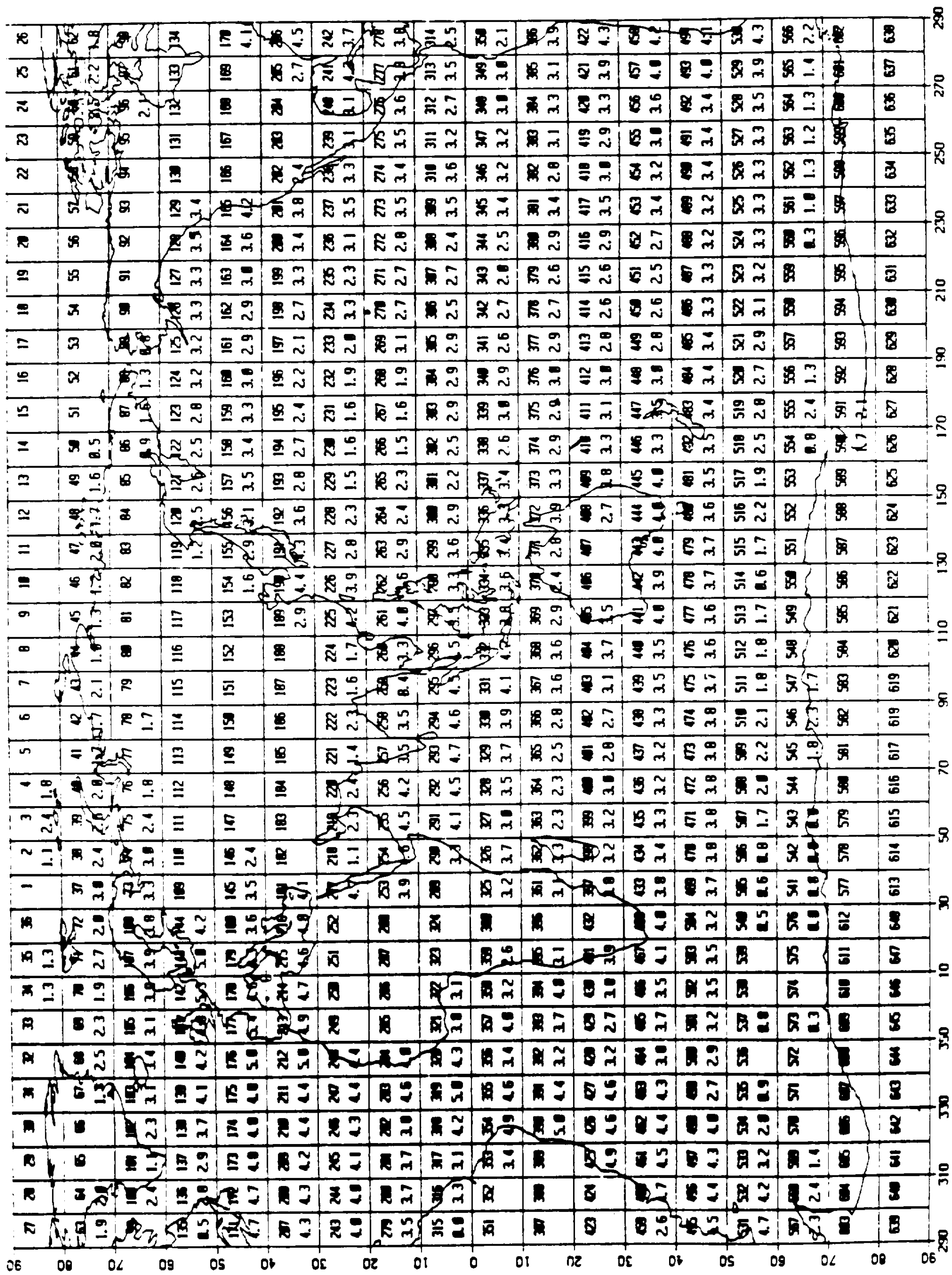


Figure 3-14. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1900-1909 (larger numerals).

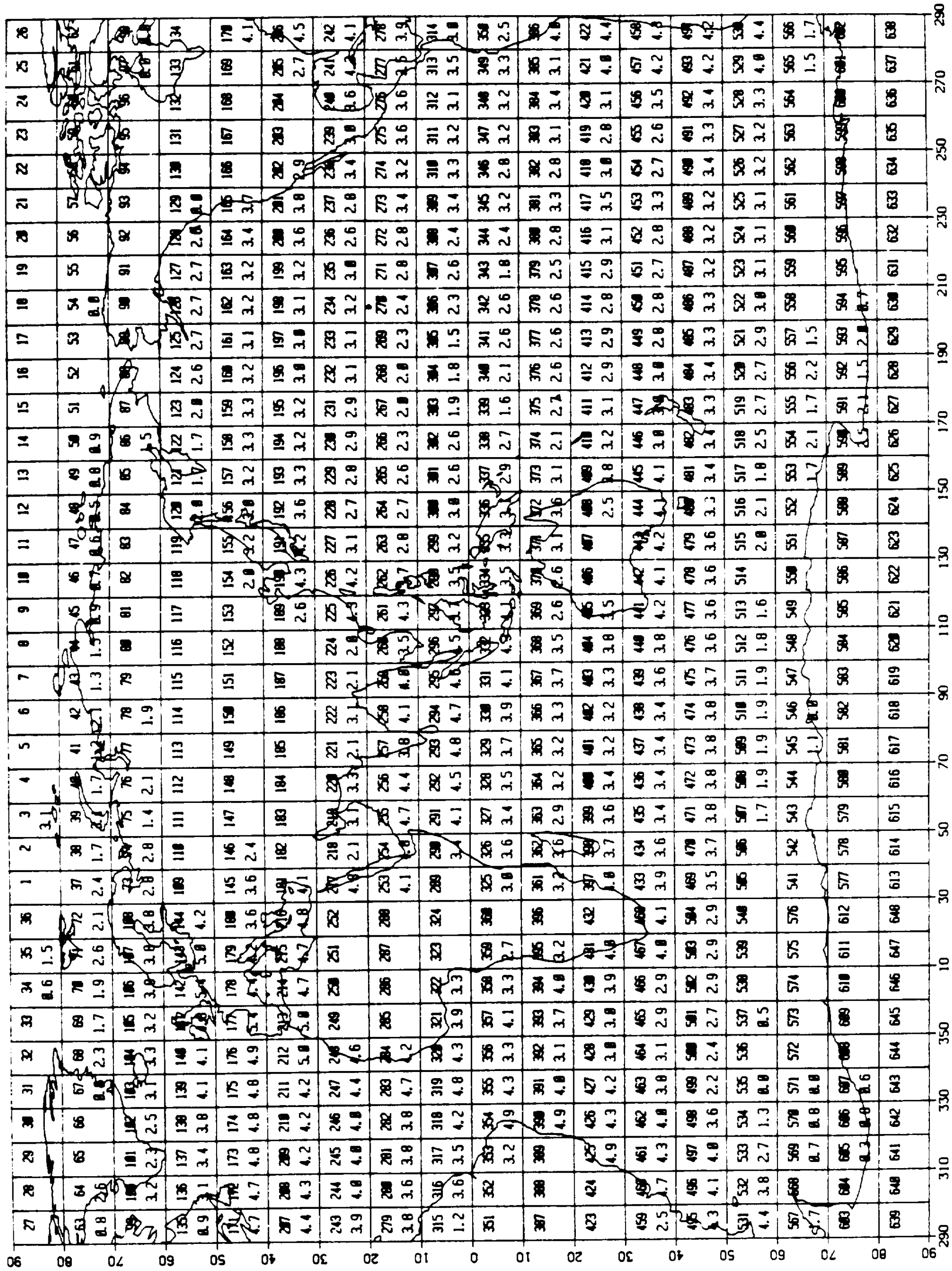


Figure 3-15. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1910-1919 (larger numerals).

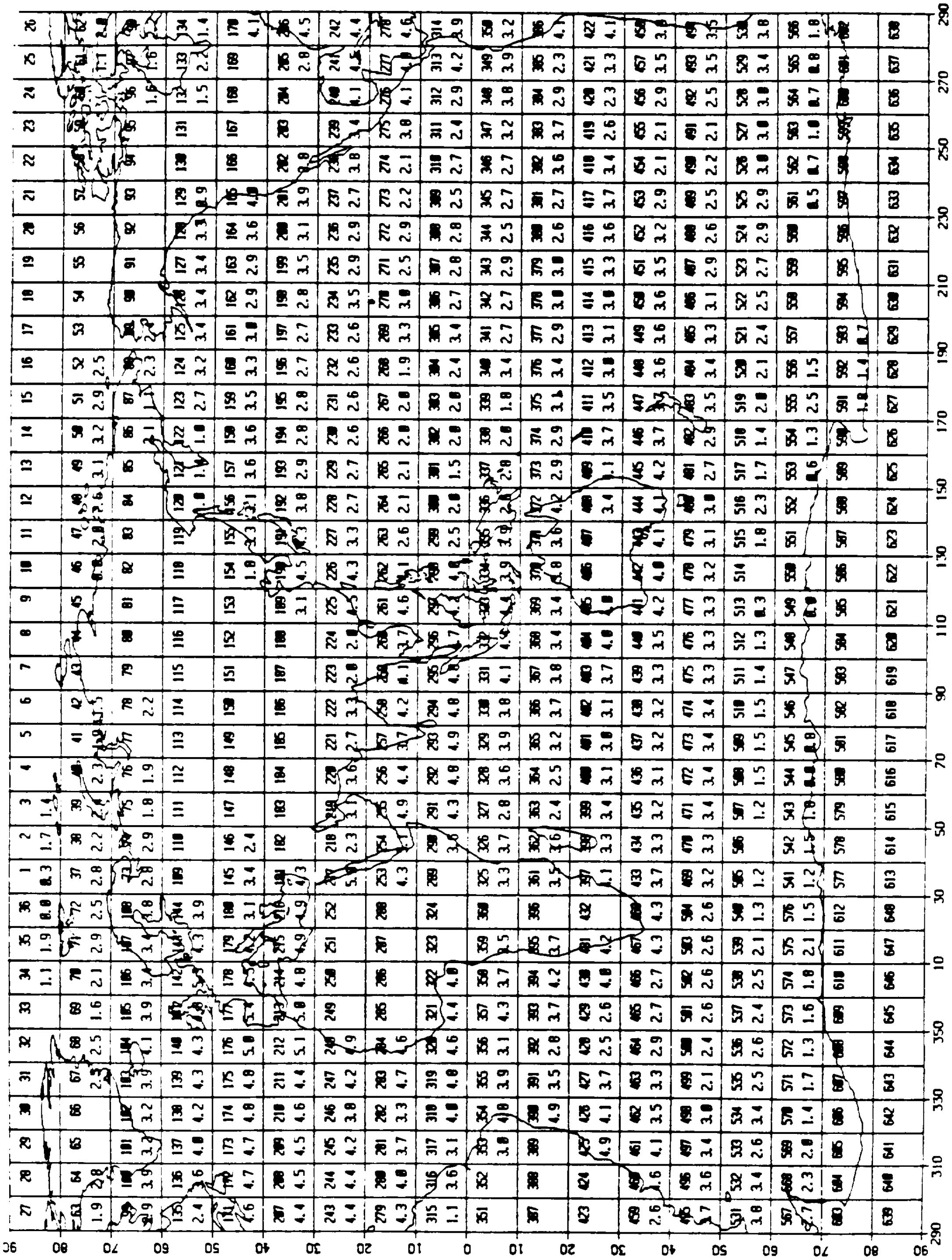


Figure 3-16. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1920-1929 (larger numerals).

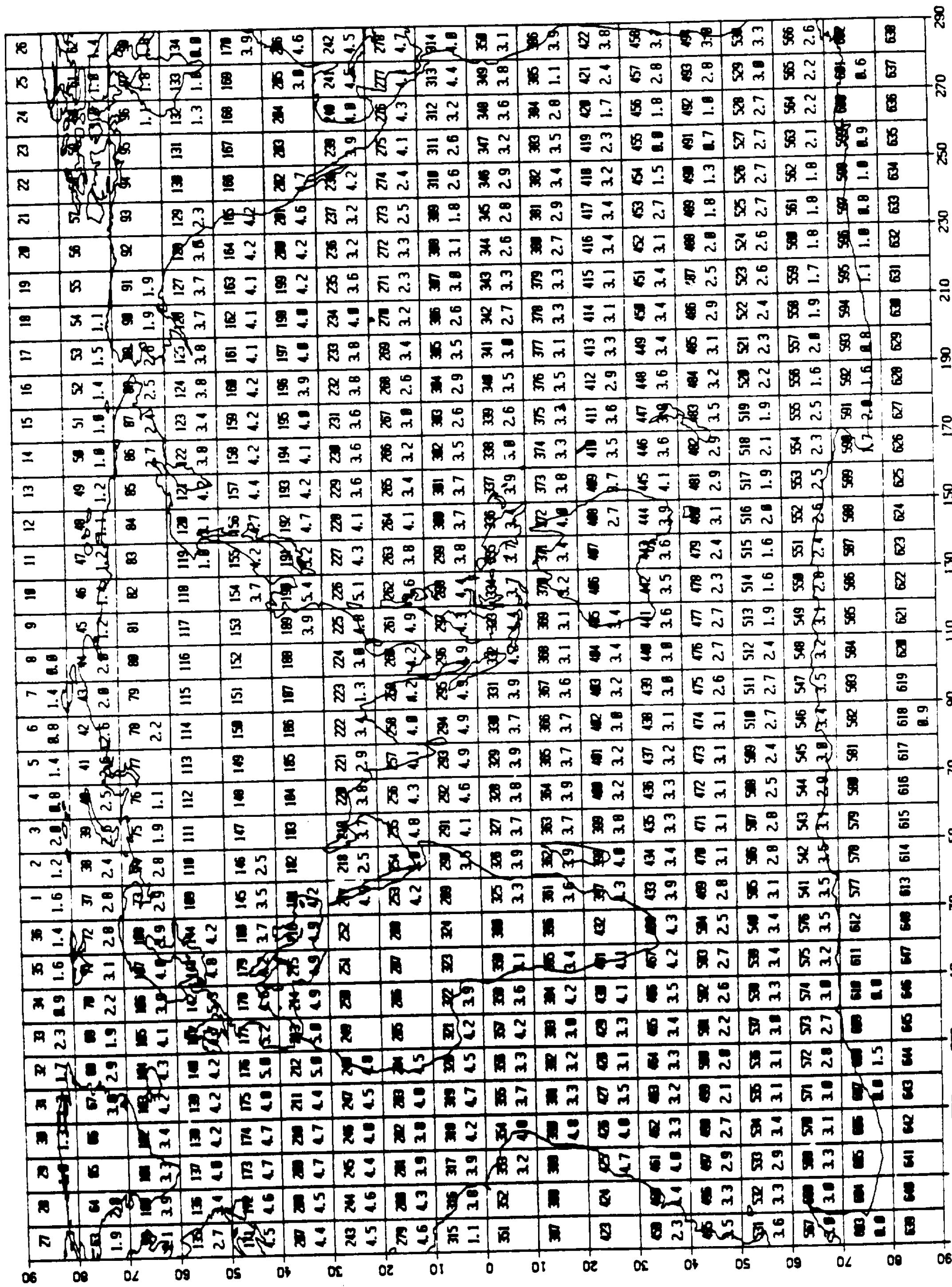


Figure 3-17. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1930-1939 (larger numerals).

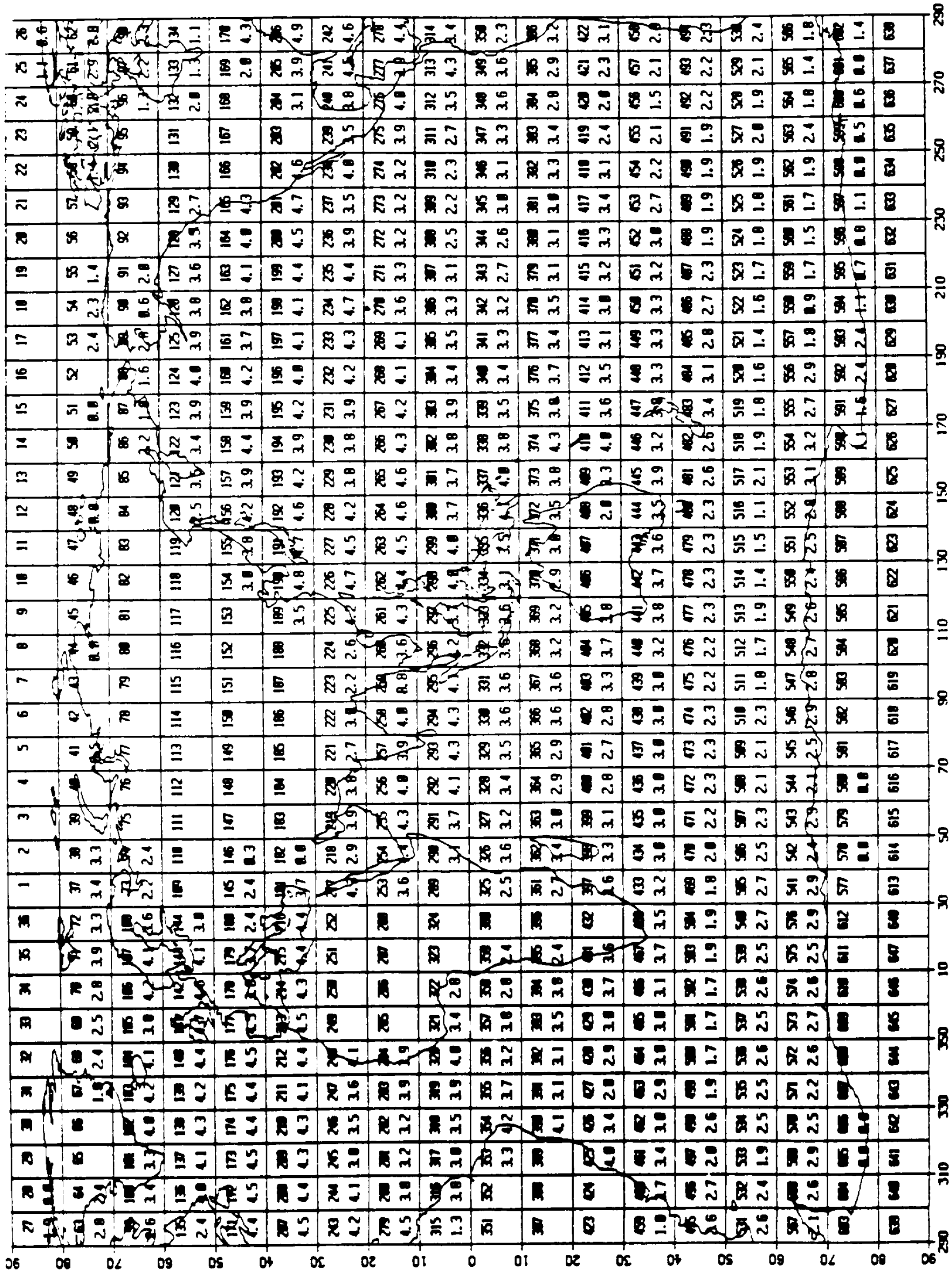


Figure 3-18. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1940-1949 (larger numerals).

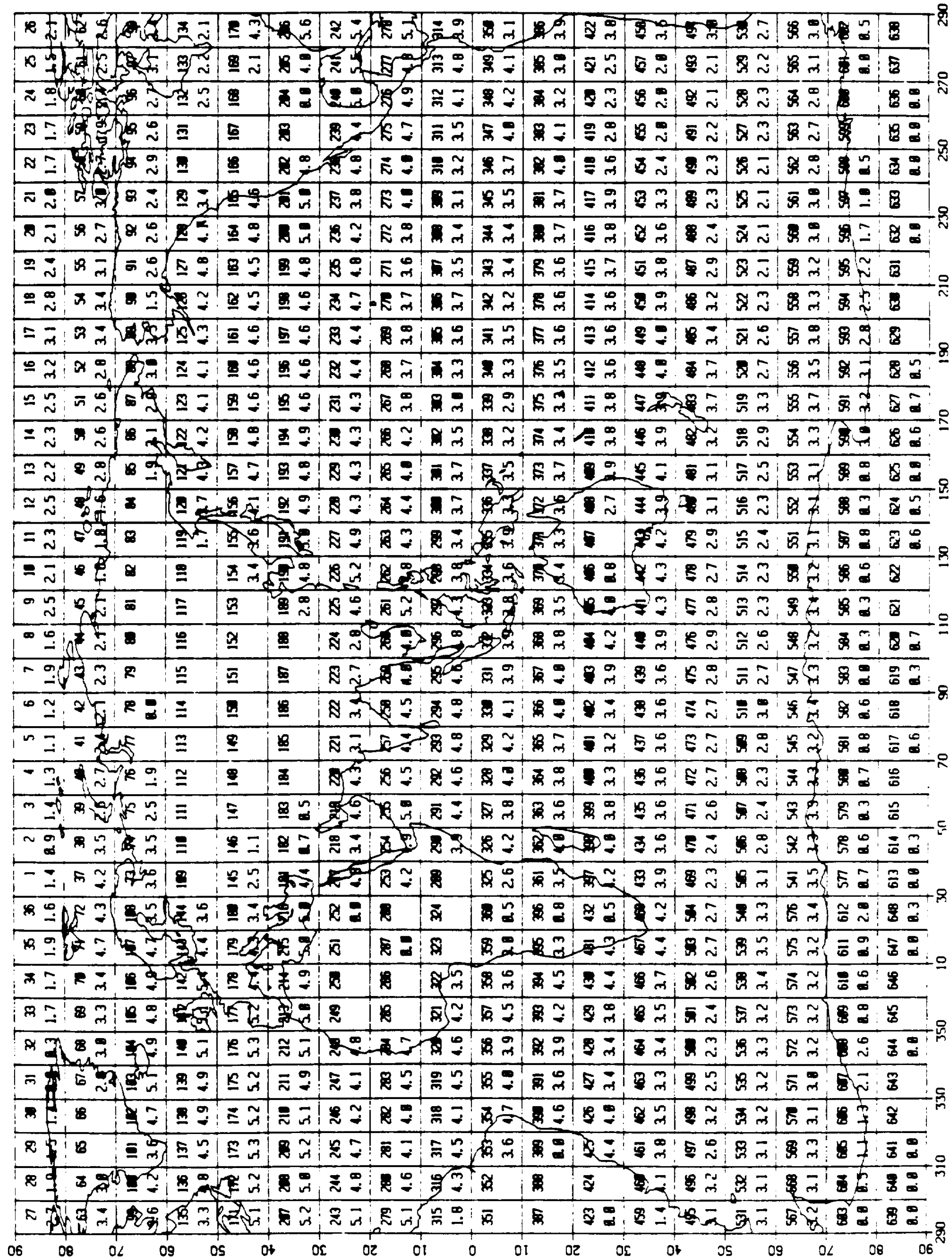


Figure 3-19. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1950-1959 (larger numerals).

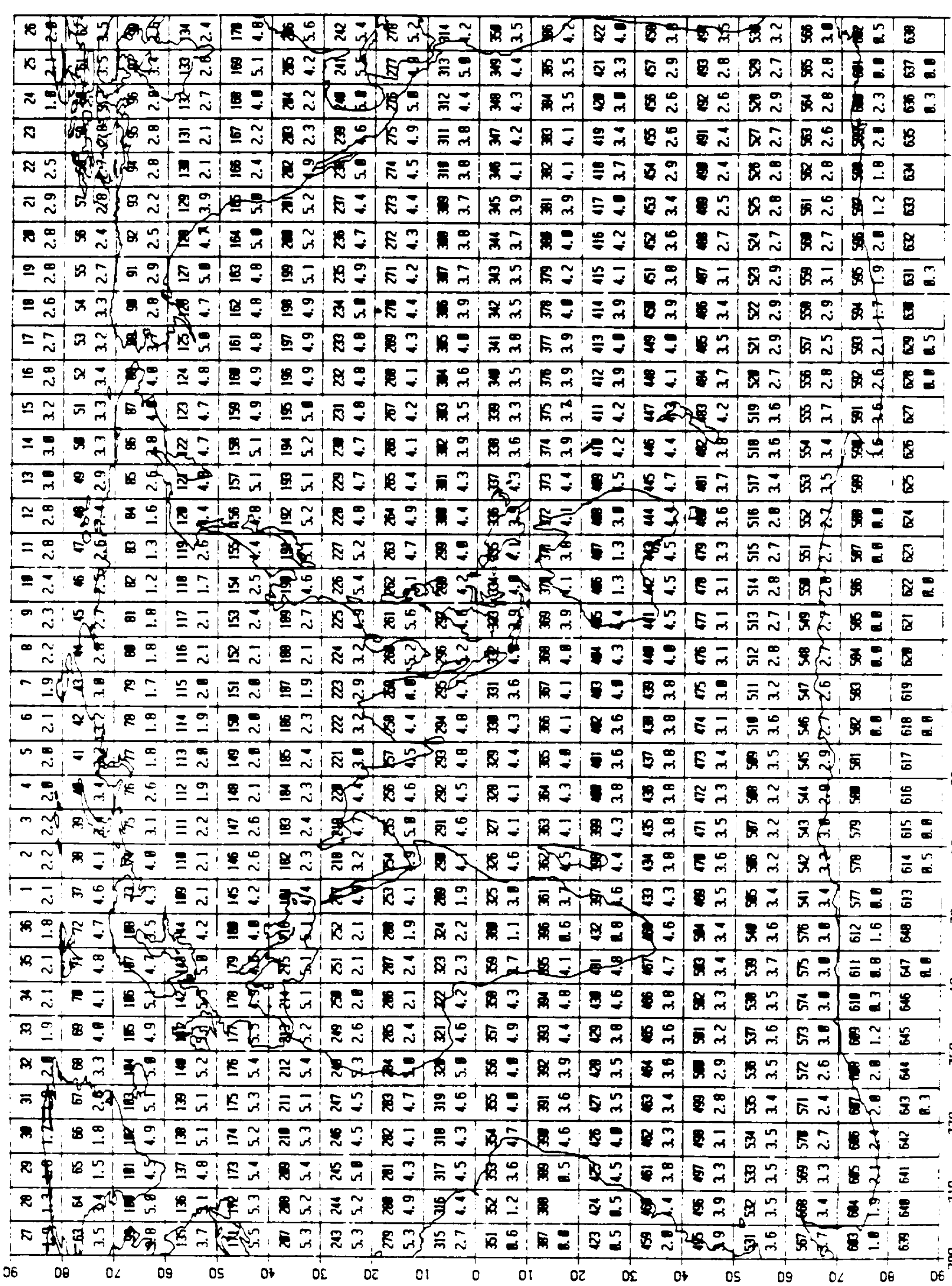


Figure 3-20. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1960-1969 (larger numerals).

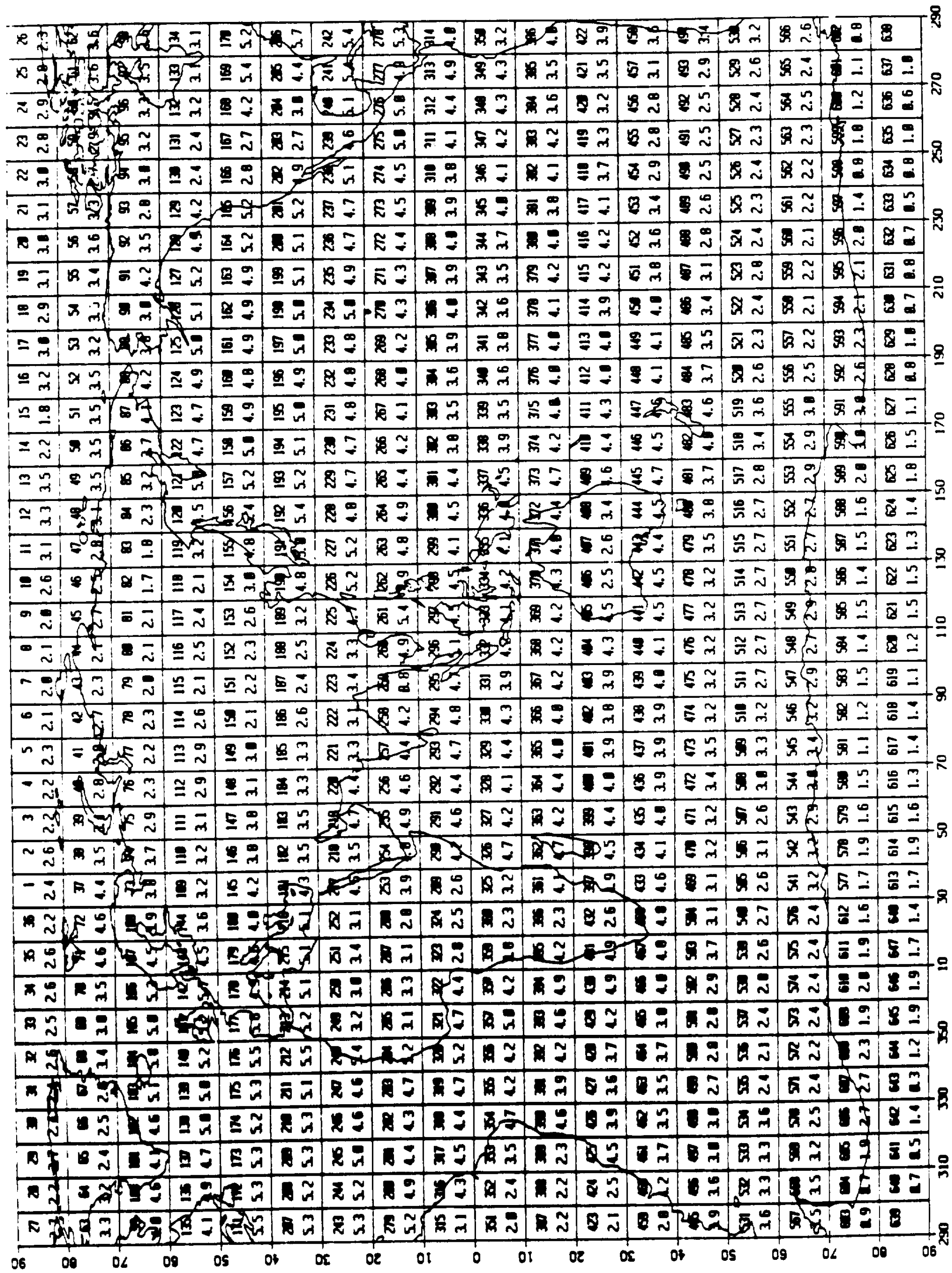


Figure 3-21. 10° boxes (smaller numerals) over $\log_{10}$ of reports 1970-1979 (larger numerals).

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Comprehensive Ocean Atmosphere Data Set: Release 1
Supplement A: 2° Monthly and Decadal Summaries
Formats: MST.3, MSU.2. DST.3, DSU.2

0. Introduction

This set of riles contains monthly and decadal summaries of marine data for the years 1854 through 1979, separated into 2° latitude x 2° longitude boxes. Details of the packed binary formats, field explanations, and the method used for computing the different variables and statistics that make up the summaries are all documented. Much of the documentation is referred to by and is essential to understand supps. B and C . The reduced-volume group files (supp. B) offer a manageable alternative, in terms of processing and storage costs, for studies using only a few variables and statistics. The derivation and format of the limits used as a basis for eliminating outliers from a portion of the summaries, together with other information about this statistical trimming process, are covered in supp. C .

1. Variables and Statistics

The 19 weather variables shown in Table A1-1 were summarized; for notational purposes each is assigned an UPPERCASE ITALIC letter called β

Table A1-1
Variables

#	β	Variable
		Observed
1	S	sea surface temperature
2	A	air temperature
3	W	scalar wind
4	U	vector wind eastward component
5	V	vector wind northward component
6	P	sea level pressure
7	C	total cloudiness
8	Q	specific humidity
		Derived
9	R	relative humidity
10	D	S - A = sea-air temperature difference
11	E	(S - A)W = sea-air temperature difference* wind magnitude
12	F	Q_δ - Q = (saturation Q at S) - Q
13	G	FW = (Q_δ - Q)W (evaporation parameter)
14	X	WU
15	Y	WV (14-15 are wind stress parameters)
16	I	UA

17 J VA
18 K UQ
19 L VQ (16–19 are sensible and latent heat transport parameters)

For each of these variables the 14 statistics shown in Table Al–2 are included; each is assigned a lowercase italic character called α.

Table A1–2
Statistics

#	α	Statistic
1	d	mean day–of–month of observations
2	h	hour statistic of observations
3	x	mean longitude of observations
4	y	mean latitude of observations
5	n	number of observations
6	m	mean
7	s	standard deviation
8	0	0/6 sextile (the minimum)
9	1	1/6 sextile (a robust estimate of m – 1s)
10	2	2/6 sextile
11	3	3/6 sextile (the median)
12	4	4/6 sextile
13	5	5/6 sextile (a robust estimate of m + 1s)
14	6	6/16 sextile (the maximum)

NOTE: these summaries were prepared for two conditions:

1) For data that have been trimmed to eliminate apparent outliers (refer to supp. C). These monthly summaries include all 19 variables x 14 statistics, and are called MST (Monthly Summaries Trimmed). A set of decadal summaries for each month is also available, called DST (Decadal Summaries Trimmed).

2) For variables 1 through 8 and statistics 1 through 14 a set of monthly summaries using untrimmed data with only gross errors removed* was created, called NISU (Monthly Summaries Untrimmed), together with a related set of decadal summaries called DSU (Decadal Summaries Untrimmed).

* Data were omitted during translation from LMR to CMR.4 as described in supp. E , or when the computation of derived quantities produced wild results (sec. 4.3). Because of their relatively poor quality, all Monterey Telecom. (deck 555) data were also excluded from the untrimmed summaries, but permitted in the trimmed summaries after trimming limits had been set. See supp. E for information on errors before or in translation to CMR.4 that affect the untrimmed summaries, but were corrected in a revised set of CMR.4 used to create the trimmed summaries (but affect them indirectly). The Marsden Square 105 (10°

box 217) omission (source ID 10) was too late to be included in any of the untrimmed summaries, but was included in the trimmed summaries.

2. Monthly Summaries

Each logical record within the Monthly Summaries Trimmed (MST) or the Monthly Summaries Untrimmed (MSU) contains all the data for an individual year–month–2° box, organized primarily by statistic, within which by variable. For example, letting $\alpha\beta$ denote the value of the statistic α for the variable β, each summary in the untrimmed file contains

$$((\alpha\beta, \beta=S,...,Q), \alpha=d,...,6)$$

which defines the following matrix, with 8 rows and 14 columns:

	α	d	h	x	y	n	m	s	0	1	2	3	4	5	6
β	#	1	2	3	4	5	6	7	8	9	10	11	12	13	14
S	1	dS	hS	xS	yS	nS	mS	sS	0S	1S	2S	3S	4S	5S	6S
A	2	dA	hA	xA	yA	nA	mA	sA	0A	1A	2A	3A	4A	5A	6A
W	3	dW	hW	xW	yW	nW	mW	sW	0W	1W	2W	3W	4W	5W	6W
U	4	dU	hU	xU	yU	nU	mU	sU	0U	1U	2U	3U	4U	5U	6U
V	5	dV	hV	xV	yV	nV	mV	sV	0V	1V	2V	3V	4V	5V	6V
P	6	dP	hP	xP	yP	nP	mP	sP	0P	1P	2P	3P	4P	5P	6P
C	7	dC	hC	xC	yC	nC	mC	sC	0C	1C	2C	3C	4C	5C	6C
Q	8	dQ	hQ	xQ	yQ	nQ	mQ	sQ	0Q	1Q	2Q	3Q	4Q	5Q	6Q

stored in the order:

column 1, row 1,..., row 8; column 2, row 1,..., row 8;...; column 14, row 1,..., row 8.

Because of the matrix organization it is possible to address each $\alpha\beta$ by its row and column number, e.g., sW = MSU(3,7). The FORTRAN programmer may find it convenient to store this matrix in an array such as DIMENSION MSU (8,14). For this reason, the tables that describe the bit layout of each format are presented in two parts: the first gives the column organization and the second gives the row organization, with column or row indices along the left-hand margin.

An MSU was output if and only if at least one report (supp. E) fell within a year–month 2° box, regardless of whether it is landlocked (according to supp. C). This happened even if there were no acceptable observations of any variable, in which case the MSU had the code zero output for missing data in each $\alpha\beta$. In contrast, an MST was output only if at least one acceptable (not trimmed) observation was found in a non–landlocked 2° box.

2.1 Monthly Summaries Trimmed (MST)

These were derived from the trimmed data that had outliers removed by a statistical process. Table A2–1a shows the bit layout of each MST and Table A2–1b shows the bit layout of each of its 152–bit or 304–bit sections, in sequential bit–order reading from top to bottom.

Table A2–1a
MST.3

#	α	Statistic	Bits
		rptin	16
		year	8
		month	4
		2° box	14
		10° box	10
		checksum	12
1	d	mean day–of–month of observations	152
2	h_t	fraction of observations in daylight	152
3	z	mean longitude of observations	152
4	y	mean latitude of observations	152
5	n	number of observations	304
6	m	mean	304
7	s	standard deviation	304
8	0	0/6 sextile (the minimum)	304
9	1	1/6 textile (a robust estimate of m – 1s)	304
10	2	2/6 sextile	304
11	3	3/6 sextile (the median)	304
12	4	4/6 sextile	304
13	5	5/6 sextile (a robust estimate of m – 1s)	304
14	6	6/6 sextile (the maximum)	304
		total	3712

Table A2–1b
152–bit or 304–bit Sections

#	β	Variable	Bits	Bits
1	S	sea surface temperature	8	16
2	A	air temperature	8	16
3	W	Scalar wind	6	16
4	U	vector wind eastward component	8	16
5	V	vector wind northward component	8	16
6	P	sea level pressure	8	16
7	C	total cloudiness	8	16
8	Q	specific humidity	8	16
9	R	relative humidity	8	16

10	D	S– A	8	16
11	E	(S – A) W	8	16
12	F	Q_δ – Q = (saturation Q at S) – Q	8	16
13	G	FW	8	16
14	X	WU	8	16
15	Y	WV	8	16
16	I	UA	8	16
17	J	VA	8	16
18	K	UQ	6	16
19	L	VQ	8	16
		total	152	304

2.2 Monthly Summaries Untrimmed (MSU)

These were derived from the untrimmed data that had only gross errors removed. Table A2–2a shows the bit layout of each MSU and Table A2–2b shows the bit layout of its 64–bit or 128–bit sections, in sequential bit-order reading from top to bottom.

Table A2–2a
MSU.2

#	α	Statistic	Bits
		rptin	16
		year	8
		Month	4
		2° box	14
		10° box	10
		checksum	12
1	d	mean day–of–month of observations*	64
2	h_u	mean hour of observations	64
3	z	mean longitude of observations	64
4	y	mean latitude of observations	64
5	n	number of observations	126
6	m	mean	128
7	s	standard deviation	128
8	0	0/6 sextile (the minimum)	126
9	1	1/6 sextile (a robust estimate of m – 1s)	128
10	1	2/6 sextile	12b
11	3	3/6 sextile (the median)	128
12	4	4/6 sextile	128
13	5	5/6 sextile (a robust estimate of m + 1s)	128
14	6	6/6 sextile (the maximum)	128
		total	1600

* In conversion from MSU.1 to MSU.2, units of mean day were reduced in precision from 0.1 to 0.2, by rounding all odd tenths positions up. Because of previous rounding, the new mean days

will tend to overestimate; e.g., a mean day of 1.4 actually signifies a mean day in the interval 11.25,1.45), centered under 1.35. To obtain the midpoint use a base of 3.75 instead of 4 as shown in Table A2–4a , except that 1.025 and 30.925 are the two extreme midpoints.

Table A2–2b
64–bit or 128–bit Sections

#	β	Variable	Bits	Bits
1	S	sea surface temperature	8	16
2	A	air temperature	8	16
3	W	scalar wind	8	16
4	U	vector wind eastward component	8	16
5	V	vector wind northward component	8	16
6	P	sea level pressure	8	16
7	C	total cloudiness	8	16
8	Q	specific humidity	8	16
		total	64	126

2.3 Reconstruction of Floating Point Data

It is assumed that the reader is familiar with techniques for transferring a binary block into memory and then extracting into INTEGER variables the bit strings whose lengths are given in Tables A2–1a and A2–1b or A2–2a and A2–2b . Refer to supp. H for more information. For a general discussion including the advantage in execution time and storage relative to traditional techniques see [3].

Compression was achieved by packing data represented as positive integers into fields whose lengths are specified in the bits column of Tables A2–1a and A2–1b or A2–2a and A2–2b . To accomplish this, a field’s floating point *true value* was divided by its *units* (the smallest increment of the data that has been encoded). After rounding, a *base* was subtracted to produce the *coded* positive integer, which was finally right–justified with zero fill in the field’s position within the summary. Using the *mS true value* 28.61 C as an example, (28.61/0.01) – (–501) = 3362.

Once a given field has been extracted into the *coded* value, the *true value* can be reconstructed by reversing the process:

*true value = (coded + base) * units*

The above *true value* example is reconstructed by (3362 + (–501)) * 0.01) = 28.61°C.

NOTE: In each coded value, zero is reserved as an indicator of missing data.

The *coded* and *true value* ranges, the *units*, and the *base* associated with each α statistic will be found in Table A2-4a ; the hour statistic is different for MST and MSU, hence the subscript on the two different entries. In the case of means, standard deviations, and sextiles these quantities are different for each β variable, hence cross-reference to Table A2-4b . For the identification fields that prefix each summary these quantities will be found in Table A2-4c .

As a representative example, suppose that the untrimmed *coded* values shown in Table A2-3a have been unpacked into FORTRAN INTEGER variables whose name is αβ prefixed by I.

Table A2-3a
Sample MSU Coded Values

Name	Coded value
IdS	151
IhA	98
IxW	56
IyU	0
InV	43
ImP	14140
IsC	25
1OQ	372

The floating-point true value of each is then αβ in Table A2-3b , where for the purposes of this example nV, mP, oQ are permissible REAL variables.

Table A2-3b
Sample MSU True Values

Instruction	Name	True value
dS = (IdS + 4) *0.2	dS	31.0 days
hA = (IhA - 1) *0.1	hA	9.7 hours
xW = (IxW - 1) *0.01	xW	0.55°
if(Iy U.EQ.0)then	yU	missing
nV= (InV + 0)*1	nV	43.
mP = (ImP + 86999)*0.01	mP	1011.39 mb
sC = (IsC - 1)* 0.1	sC	2.4 okta
OQ = (IOQ - 1)* 0.01	OQ	3.71 g kg^{-1}

Table A2–4a
Unpacking Statistics

#	α	Statistic	True value	Units*	Base	Coded
1	d	mean day–of–month of observations	1.0 ≤ 31.0**	0.2 day	4	1 ≤ 151
2	h_t	fraction of observations in daylight	0.00 ≤ 1.00	0.01	–1	1 ≤ 101
2	h_u	mean hour of observations	0.0 ≤ 23.0	0.1 hour	–1	1 ≤ 231
3	x	mean longitude of observations	0.00 ≤ 2.00	0.01	–1	1 ≤ 201
4	y	mean latitude of observations	0.004 ≤ 2.00	0101	–1	1 ≤ 201
5	n	number of observations	1≤ 65535	1	0	Same
6	m	mean	Table A2–4b	Table A2–4b	Table A2–4b	Table A2–4b
7	s	standard deviation	0≤ ***	Table A2–4b	–1	1 ≤***
8–14	0–6	sextiles	Table A2–4b	Table A2–4b	Table A2–4b	Table A2–4b

* ”Units” gives the smallest increment of the data that has been encoded. Thus a change of one unit in the integer coded value represents a change in the true raise of one of the units shown.
**m ≤ n denotes ”from m through n inclusive.”
*** Standard deviations have a true raise ranging upwards from zero for all variables, thus the base is always 1 Units for each variable are still chosen from Table A24b .

Table A2–4b
Unpacking Variables

#	β	Variable	True value	Units	Base	Coded
		Observed				
1	S	sea surface temperature	–5.00≤ 40.00	0.01° C	–501	1≤4501
2	A	air temperature	–88.00 ≤58.00	0.01° C	–8801	1≤14601
3	W	scalar wind	0.00 ≤102.20	$0.01 ms^{-1}$	–1	1≤10221
4	U	vector wind eastward component	–102.20 ≤102.20	$0.01 ms^{-1}$	–10221	1≤20441
5	V	vector wind northward component	–102.20≤ 102.20	$0.01 ms^{-1}$	–10221	1≤20441
6	P	sea level pressure	870.00 ≤1074.60	0.01 mb	86999	1≤20461
7	C	total cloudiness	0.0 ≤8.0	0.1 okta	–1	1≤81
8	Q	specific humidity	0.00 ≤40.00	$0.01 g kg^{-1}$	–1	1≤4001
		Derived				
9	R	relative humidity	0.0 ≤100.0	0.1%	–1	1≤1001
10	D	S – A	.63.00 ≤128.00	0.01° C	–6301	1≤19101
11	E	(S – A) W	–1000.0 ≤1000.0	$0.1° C ms^{-1}$	–10001	1≤20001
12	F	Q_δ – Q = (saturation Q at S) – Q	–40.00≤40.00	$0.01 g kg^{-1}$	–4001	1≤8001
13	G	FW	–1000.0≤1000.0	$0.1 g kg^{-1} ms^{-1}$	–10001	1≤20001
14	X	WU	–3000.0≤3000.0	$0.1 m^2 s^{-2}$	–30001	1≤60001
15	Y	WV	–3000.0≤3000.0	$0.1 m^2 s^{-2}$	–30001	1≤60001
16	I	UA	–2000.0≤2000.0	$0.1° C ms^{-1}$	–20001	1≤40001
17	J	VA	–2000.0≤2000.0	$0.1° C ms^{-1}$	–20001	1≤40001
18	K	UQ	–1000.0≤1000.0	$0.1 g kg^{-1} ms^{-1}$	–10001	1≤20001
19	L	VQ	–1000.0≤1000.0	$0.1 g kg^{-1} ms^{-1}$	–10001	1≤20001

Table A2–4c
Unpacking Identification Fields

Field	True value	Units	Base	Coded
RPTIN	n/a	n/a	n/a	n/a
year	1800≤2054	1	1799	1≤255
month	1≤ ×12	1	0	same

2° box	1⩽≤⩽16202	1	0	same
10° box	1⩽≤⩽648	1	0	same
checksum	n/a	n/a	n/a	n/a

Further descriptions of the Fields in Table A2–4c follow.

- RPTIN

  These bits are reserved for use of the RPTIN unblocking utility, where available (e.g., NCAR). Otherwise they may be ignored.

- year

  The year can range from 1800 to 2054.

- month 1=January, 2=February,..., 12=December.

- 2° box
  10° box

  See supp. G for a description of the 2° and 10° box systems, and supp. H for related software.

- checksum

  A checksum was computed and stored with each packed summary as a measure of reliability during storage and transmission. For both untrimmed and trimmed summaries, the checksum is computed by

  1) Summing coded values of all other fields in the summary besides RPTIN and the checksum.

  2) Obtaining the modulo (2^{12}–1) of the sum.

  Repeating this calculation for every unpacked summary, and then verifying that the checksum so obtained agrees with the coded checksum stored in the summary, is strongly encouraged. For example, supposing that the coded untrimmed data matrix is available in an array, MSU, the checksum CK is computed and verified against the stored checksum CKS in FORTRAN as follows:

```
INTEGER CK,J,I,MSU(8,14), YEAR, MONTH, BOX2, BOX10, CKS
CK = 0
DO 500 J = 1,14
    DO 400 I = 1,8
        CK = CK + MSU(I,J)
400 CONTINUE
```

```
500 CONTINUE
CK = CK + YEAR + MONTH + BOX2 + BOX10
CK = MOD(CK,4095)
IF(CK.NE. CKS) THEN
PRINT*, 'ERROR. CK = ',CK,'.NE. CKS = ',CKS
STOP
ENDIF
```

Note that using modulus 2^{12}–1 takes into account every bit of CK, versus chopping at the twelfth bit using modulus 2^{12}

3. Decadal Summaries

Each logical record within the Decadal Summaries Trimmed (DST) or the Decadal Summaries Untrimmed (DSU) contains all the data for an individual decade–month–2° box, organized primarily by variable, within which by statistic. (NOTE: this organization is transposed from that of the monthly summaries.)

A DSU was output if and only if at least one report (supp. E) fell within a decade–month–2° box, regardless of whether it is landlocked (according to supp. C). This happened even if there were no acceptable observations of any variable, in which case the DSU had the code zero output for missing data in each $\alpha\beta$. In contrast, a DST was output only if at least one acceptable (not trimmed) observation was found in a non–landlocked 2° box.

3.1 Decadal Summaries Trimmed (DST)

Table A3–1a shows the bit layout of each DST and Table A3–1b shows the bit layout of each of its 160–bit sections, in sequential bit–order reading from top to bottom.

Table A3–1 a
DST.3

#	β	Variable	Bits
		rptin	16
		decade	8
		month	4
		2° box	14
		10° box	10
		checksum	12
1	S	sea surface temperature	160
2	A	air temperature	160
4	U	vector wind eastward component	160
5	V	vector wind northward component	160
6	P	sea level pressure	160
8	Q	specific humidity	160
9	R	relative humidity	160
		$\Sigma UV/n$	32
		$\Sigma U^2/n$	32
		$\Sigma V^2/n$	32
		total	1280

Table A3–1b
160–bit Sections

#	α	Statistic	Bits
5	n	number of observations	16
6	m	mean	16
7	s	standard deviation	16
8	0	0,16 sextile (the minimum)	16
9	1	1/6 sextile (a robust estimate of m – 1s)	16
10	2	2/6 sextile	16
11	3	3/6 sextet (the median)	16
12	4	4/6 Textile	16
13	5	5/6 sextile (a robust estimate of m + 1s)	16
14	6	6/6 textile (the maximum)	16
		total	160

3.2 Decadal Summaries Untrimmed (DSU)

Table A3–2a shows the bit layout of each DSU and Table A3–2b shows the bit layout of each of its 128–bit sections, in sequential bit–order reading from top to bottom.

Table A3–2a
DSU.2

#	β	Variable	Bits
		rptin	16
		decade	8
		month	4
		2° box	14
		10° box	10
		checksum	12
1	S	sea surface temperature	128
2	A	air temperature	128
4	U	vector wind eastward component	128
5	V	vector wind northward component	128
6	P	sea level pressure	128
9	R	relative humidity	128
		mean of U	16
		mean of V	16
		$\Sigma UV/n$	32
		$\Sigma U^2/n$	32
		$\Sigma V^2/n$	32
		total	960

Table A3–2b
128–bit Sections

#	α	Statistic	Bits
8	1	0/6 sextile the minimum)	16
9	1	1/6 sextile (a robust estimate of m – 1s)	16
10	2	2/6 sextile	16
11	3	3/6 sextile (the median)	16
12	4	4/6 sextile	16
13	5	5/6 sextile (a robust estimate of m + 1s)	16
14	6	6/6 sextile (the maximum)	16
5	n	number of observations	16
		total	128

Table B3–2a
MSTG Interval Behaviour

#	α	Lowest		Central			Highest	
		Interval	δ	reported	Basex	δ	Interval	δ
1	d	(1,3.1)	+0.05	(–0.9,+1.1)	0.05	+0.1	(29.1,31)	+0.05
2	h_t	(0,0.055)	+0.0275	(–0.045,+0.055)	–0.95	+0.005	(0.955,1)	+0.0225
3	x	(0,0.205)	+0.0025	(–0.095,+0.105)	–0.475	+0.005	(1.805,2)	+0.0025
4	y	(0,0.205)	+0.0025	(–0.095,+0.105)	–0.475	+0.005	(1.805,2)	+0.0025

Table B3–2b
MSUG Interval Behaviour

#	α	Lowest		Central			Highest	
		Interval	δ	reported	Basex	δ	Interval	δ
1	d	(1,3.05)	+0.025	(−0.95,+1.05)	0.025	+0.05	(29.05,31)	+0.025
2	h_u	(0,2.05)	+0.025	(−0.95,+1.05)	−0.475	+0.05	(22.05,23)	−0.475
3	x	(0,0.205)	+0.0025	(−0.095,+0.105)	−0.475	+0.005	(1,805,2)	+0.0025
4	y	(0,0.205)	+0.0025	(−0.095,+0.105)	−0.475	+0.005	(1.805,2)	+0.0025

3.3 Reconstruction of Floating Point Data

The coded and true value ranges, the units, and the base for the decadal fields that are unique to the decadal summaries are given in Table A3–3 . All other fields are common to the monthly Summaries, with characteristics as given in sec. 2.3 .

Table A3–3
Unpacking Decadal Summaries

Field	True value	Units	Base	Coded
decade	180⩽205	1	179	1⩽26
$(\Sigma UV)/n$	−5222.42⩽5222.42	0.01 ms^{-1}	−522243	1⩽1044485
$(\Sigma U^2)/n$	0⩽10444.84	0.01 ms^{-1}	−1	1⩽1044485
$(\Sigma V^2)/n$	0⩽10444.84	0.01 ms^{-1}	−1	1⩽1044485

Further descriptions of the Fields in Table A3–3 follow.

- decade

  This is simply the true value YEAR with the units position omitted; i.e., using INTEGER truncating arithmetic,

  DECADE=YEAR/10

- $(\Sigma UV)/n$
  $(\Sigma U^2)/n$
  $(\Sigma V^2)/n$

  A variance /covariance matrix can be obtained using these plus the mean of U and V, where n is from either U or V

4. Computational Method

The method of computing all the different statistics and variables is given, together with the computational dependencies of the variables on each other. The data used as a basis for trimming and their derivation are described in supp. C .

4.1 Statistics

The method of computing statistics is the same for all variables. (The method of computing the fraction of observations observed in daylight is described in sec. 4.2 ; here h refers to h_u) Let a_i denote either a single observation of one variable, or, where applicable, a single measure of observational location: the day, hour, latitude, or longitude it was taken at.

Let M represent any one of the five mean statistics d, h, z, y, m computed for the n a_i by

$$M = \frac{\left[\sum_{i=1}^{n} a_i\right]}{n} \qquad (1)$$

for n > 0. For each of x, y, and m, n = *n* (*n* is the number of observations in the summary); for d and h, n ≤ *n* because an individual day or hour may be missing. Consequently, the means d or h may be missing when x, y, and m are not.

The standard deviation s about the mean m is then

$$s = \left[\frac{\sum_{i=1}^{n} (a_i - m)^2}{n - 1}\right]^{1/2} \qquad (2)$$

for n > 1, or s = 0 if *n* = 1

To compute the sextiles 0, 1, 2, 3, 4, 5, 6, the observations must first be ranked in ascending order such that $a_i \leq a_{i+1}$, for any i < *n*. Ordinarily, each sextile, S_j, , would be

$$S_j = a_{(j/6)(n-1)+1} \qquad \text{for } j=0,...,6. \qquad (3)$$

But the (j/6) for j = 1 and 5 have been adjusted slightly to 0.1587 and 0.8413, in order to correspond to the cumulative area under the standardized normal (m = 0; s = 1) curve at ≤ –1 and ≤+ 1 standard deviations, respectively. Also, (j modulo 6) is guaranteed to be zero only at j = 0 and 6. In all but the case of the minimum and maximum, instead of (3), first

$$f = \begin{cases} (j/6)(n-1) + 1 & \text{for } j = 2,3,4, \\ (0.1587)(n-1) + 1 & \text{for } j = 1, \\ (0.8413)(n-1) + 1 & \text{for } j = 5, \end{cases} \quad (4)$$

using floating point arithmetic. Second, letting k equal the integer part of f

$$s_j = a_k + (f-k)(a_{k+1} - a_k) \quad (5)$$

Equation (5) does a linear interpolation to the jth sextile, s_j, (f-k) of the distance between a_k and a_{k+1}, in case f has a fractional part.

The sextiles were actually computed (using FORTRAN) from an INTEGER histogram whose stepsize and length represent one-tenth the units and true value range, respectively, required for a particular variable by Table A2-4b (i.e., reduced in each case by omitting the least significant decimal place). Variables that were computed to floating point precision, rather than available directly as fields in the input report (see sec. 4.3), were rounded to the nearest histogram step. Since the mean m and standard deviation s were computed separately using floating point data before rounding, the median and mean may differ slightly in cases where they would be identical using infinite-precision arithmetic.

4.2 Fraction of Observations In Daylight

When the east longitude X and HOUR in GMT of a report are used, the absolute hour difference of the report from local solar noon is

$$t = |((\text{HOUR} + X/15) \bmod 24) - 12| , \quad (6)$$

with a modulus of 24 in case the report falls in the local solar day succeeding the GMT day (the possible effect of this day crossover on local solar month is ignored). For the two polar 2° boxes, X is zero by convention.

A report is said to fall in daylight if t is no greater than Δt, the half length of the duration of daylight, in which case a separate counter k for each variable is incremented (only provided the observation of that variable is extant and not trimmed):

$$k = k + 1 \text{ iff } t \leqslant \Delta t \qquad (7)$$

Upon completion of a year-month-2° box containing n observations of one variable, the statistic h_t, (the fraction of reports in daylight) is

$$h_t = k/n \; . \qquad (8)$$

For computational efficiency, a 12 months x 90 latitudes table of representative values for Δt was derived from the declination angle of the sun δ at the middle of each month, as listed in Table A4-1 , and from the middle latitude y_1 of each zone of 2° boxes (89° N, 87° N,...,89° S).

Table A4-1
Mid-month Declination

Mid-month	δ
16 January	-21.16
15 February	-13.09
16 March	-2.22
15.5 April	9.51
16 May	18.81
15.5 June	23.285
16 July	21.57
16 August	14.14
15.5 September	3.315
16 October	-8.43
15.5 November	-18.31
16 December	-23.27

Data within the two polar 2° boxes are handled as if they were in the adjacent zone 89° N or 89° S. The entries of Δt are derived from the "hour angle" as is given by τ_0

$$\cos \tau_0 = -\tan y_1 \tan \delta \; , \qquad (9)$$

except that in case the absolute value of the right-hand side of (9) exceeds one (within the Arctic or Antarctic Circles), the right-hand side retains its sign but assumes in absolute value of one. Finally, τ_0 degrees converts to Δt hours by

$$\Delta t = \tau_0/15 \qquad (10)$$

since 360 degrees corresponds to 24 hours.

4.3 Variables

The first seven "observed" variables are available directly as fields in the input report (S, A, W, U, V, P, C) although [U V]' is actually observed as magnitude W and direction D; Q and the eleven other variables are derived from these or one other report field: dew point depression DP. A variable is not computed if it is dependent on a variable that is missing or has been trimmed. Table A4–2 lists the report fields (from supp. E) that are necessary to compute each variable; Figure A4–1 illustrates the order in which variables are computed and trimmed, including other dependencies.

Table A4–2
Fields Necessary to Compute Variables

Variable	Report field							
	S	A	DP	W	U	V	P	C
"Observed"								
S	X							
A		X						
W				X				
U					X			
V						X		
P							X	
C								X
Q		X	X				X	
Derived								
R		X	X					
S – A	X	X						
(S – A)W	X	X		X				
Q_δ – Q	X	X	X				X	
(Q_δ – Q)W	X	X	X	X			X	
WU				X	X			
WV				X		X		
UA		X	X		X		X	
VA		X			X			
UQ	X	X		X		X		
VQ	X	X			X	X		

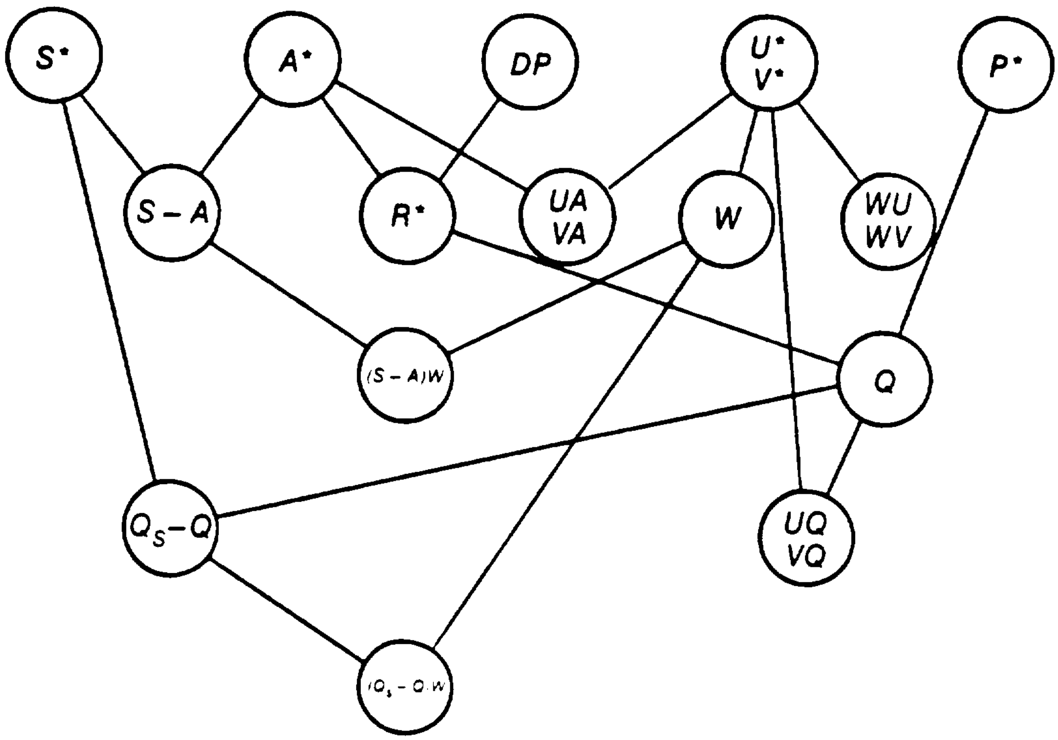

Figure A4-1. Variable hierarchy. In order for a variable to be computed, the variables that are connected to it and above it must have been computed to fall within their respective *true value* ranges and not be trimmed. All the nodes are applicable only to MST; an asterisk marks the explicitly trimmed variables. For other products the appropriate sub-graph still applies, with two untrimmed exceptions: 1) although R does not appear in MSU, one condition for Q is that R be successfully computed for DSU; and 2) in MSU and DSU, an observation of W is accepted even if U and V are missing (because of a report containing wind speed without direction). The paired variables, which are all functions of U and V, appear in the same node -- but processing of the U function actually precedes processing of the V function. Also, processing is never reversed; e.g., if R is trimmed A is not reprocessed.

4.4 Moisture Variables

The derived moisture variables (Q, R, and Q_δ) are computed using the FORTRAN functions that are given in [10] and referenced as follows:

Q = SSH(P,A – DP)
R = HUM(A,A – DP)
Q_δ = SSH(P,S)

Inside SSH the mixing ratio is approximated by function WMR. The method of computing vapor pressure differs in the untrimmed and trimmed summaries. Function ESLO was used in the untrimmed summaries. Unfortunately, ESLO is unreliable at physically unrealistic conditions, although tests have demonstrated that, at least, no R exceeded 100%. Function ES was used instead in the trimmed summaries. These algorithms were chosen because of their accuracy and computational efficiency. For more detailed information including the original source of these techniques see [10].

Comprehensive Ocean–Atmosphere Data Set; Release 1
Supplement B: 2° Monthly Summary Groups
Formats: MSUG.1, MSTG.1

0. Introduction

The seven group files are relatively compact alternatives to the full Monthly Summary Trimmed and Untrimmed (MST or MSU) formats, intended for studies using only a few variables or statistics. Eight important statistics for each of four related variables are grouped together in each file using a packed binary format. Thus five files are needed to represent all 19 MST variables, and two files are needed to represent all eight MSU variables. The statistics were chosen to bring together information that can be used to analyze the variability of the data and inhomogeneities of their distribution in time and space.

Cross reference is made to supp. A for standardized unpacking information, and the same notation for variables and statistics is followed or extended, also using the same type of two dimensional table presentation.

1. Monthly Summary Trimmed Groups (MSTG)

The five trimmed groups were derived from MST (described in supp. A). Each MST was split into five MSTG records; these were written out onto the five separate group files even if every $\alpha\beta$ (the value of the statistic α for the variable β) was missing. Thus the record structure is identical for all the groups and their parent MST file. The five trimmed groups are numbered 3–7 to distinguish them from the untrimmed groups (numbered 1–2). Groups 3–7 contain four variables each: 3 = (S, A, Q, R), 4 = (W, U, V, P), 5 = (C, R, X, Y), 6 = (D, E, F, G), and 7 = (I, J, K, L). Table B1–1a shows the bit layout in common to any MSTG, and Tables B1–1b through B1–1f show the bit layout of each of the 64–bit or 16–bit sections of groups 3 through 7, respectively, in sequential bit–order reading from top to bottom. An example showing the bit–order is given following Table B1–1f .

Table B1–1a
MSTG.1

#	α	Statistic	Bits
		rptin	16
		year	8
		month	4
		2° box	14
		10° box	10
		identification checksum	12
11	$\mathcal{S}$	3/6 sextile (the median)	64
6	m	mean	64
5	n	number of observations	64
15	e	standard deviation estimate	64
1	d	mean day–of–month of observations	16
2	h_t	fraction of observations in daylight	16
3	x	mean longitude of observations	16
4	y	mean latitude of observations	16
		total	384

Table B1–1b
Group 3
64–bit or 16–bit Sections

#	β	Variable	Bits	Bits
1	S	sea surface temperature	16	4
2	A	air temperature	16	4
8	Q	specific humidity	16	4
9	R	relative humidity	16	4
		total	64	16

Table B1–1C
Group 4
64–bit or 16–bit Sections

#	β	Variable	Bits	Bits
3	W	scalar wind	16	4
4	U	vector wind eastward component	16	4
5	V	vector wind northward component	16	4
6	P	sea level pressure	16	4
		total	64	16

Table B1-1d
Group 5
64-bit or 16-bit Sections

#	β	Variable	Bits	Bits
7	C	total cloudiness	16	4
9	R	relative humidity	16	4
14	X	WU	16	4
15	Y	WV (14-15 are wind Stress parameters)	16	4
		total	64	16

Table B1-1e
Group 6
64-bit or 16-bit Sections

#	β	Variable	Bits	Bits
10	D	S - A = sea-air temperature difference	16	4
11	E	(S - A) W = sea-air temperature difference * wind magnitude	16	4
12	F	Q_δ - Q = (saturation Q at S) - Q	16	4
13	G	FW=(Q_δ - Q) W (evaporation parameter)	16	4
		total	64	16

Table B1-1F
Group 7
64-bit or 16-bit Sections

#	β	Variable	Bits	Bits
16	1	UA	16	4
17	J	VA	16	4
18	K	UQ	16	4
19	L	VQ (16-19 are sensible and latent heat transport parameters)	16	4
		total	64	16

For example, group 3 contains, in order: rptin, year, month, 2° box, 10° box, and identification checksum, followed by

$$((\alpha\beta, \beta = S,A,Q,R),\ \alpha = \mathcal{S},m,n,e,d,h,x,y)$$

which defines the following matrix, with 4 rows and 8 columns:

β	α #	i 11	m 6	n 5	e 15	d 1	h 2	z 3	y 4
S	1	gS	Ms	nS	eS	dS	hS	xS	yS
A	2	gA	mA	nA	cA	dA	hA	xA	yA
Q	8	gQ	MQ	nQ	CQ	dQ	hQ	xQ	yQ
R	9	gR	mR	nR	eR	dR	hR	xR	yR

stored in the order:

column 1, row 1,..., row 4; column 2, row 1,..., row 4; ...; column 8, row 1, ..., row 4.

2. Monthly Summary Untrimmed Groups (MSUG)

The two untrimmed groups were derived from MSU (described in supp. A). Each MSU was split into two MSUG records; these were written out onto the two separate group files even if every αβ (the value of the statistic α for the variable β) was missing. Thus the record structure is identical for all the groups and their parent MSU file. Groups 1–2 contain four variables each: I = (S, A, P, Q), 2 = (W, U, V, C). Table B2–1a shows the bit layout in common to any MSUG, and Tables B2–1b and B2–1c show the bit layout of each of the 64-bit or 16-bit sections of group 1 and group 2, respectively, in sequential bit-order reading from top to bottom.

Table B2–1a
MSUG.1

#	α	Statistic	Bits
		rptin	16
		year	8
		month	4
		2° box	14
		10° box	10
		identification checksum	12
11	$\mathcal{S}$	3/6 sextile (the median)	64
6	m	mean	64
5	n	number of observations	64
15	c	standard deviation estimate	64
1	d	mean day-of-month of observations	16
2	h_u	mean hour of observations	16
3	z	mean longitude of observations	16
4	y	mean latitude of observations	16
		total	384

Table B2–1b
Group 1
64–bit or 16–bit Sections

#	β	Variable	Bits	Bits
1	S	sea surface temperature	16	4
2	A	air temperature	16	4
6	P	sea level pressure	16	4
8	Q	specific humidity	16	4
		total	64	16

Table B2–1c
Group 2
64–bit or 16–bit Sections

#	β	Variable	Bits	Bits
3	W	scalar wind	16	4
4	U	Vector wind eastward component	16	4
5	V	vector wind northward component	16	4
7	C	total cloudiness	16	4
		total	64	16

3. Reconstruction of Floating Point Data

The coded and true value ranges. the units, and the base for the fields that are unique in representation to the groups are given in Table B3–1 .

Table B3–1
Unpacking Groups

#	α	Statistic	True value	Units	Base	Coded
1	d	mean day–of–month of observations	2⩽30	2 days	0.0	1⩽15
2	ht	fraction of observations in daylight	0.0⩽1.0	0.1	–1	1⩽11
2	hu	hour of observations	1⩽23	2 hours	–0.5	1⩽12
3	x	mean longitude of observations	0.1⩽1.9	0.2°	–0.5	1⩽10
4	y	mean latitude of observations	0.1⩽1.9	0.2°	–0.5	1⩽10

Further descriptions of the fields in Table B3–1 follow. All other fields are common to the MST or MSU, with characteristics as given in sec. 2.3 of supp. A , except that some fields have different names and other differences as noted.

- identification checksum

The group number, 1 for (S, A, P, Q), 2 for (W, U, V, C), 3 for (S, A, Q, R), 4 for (W, U, V, P), 5 for (C, R, X, Y), 6 for (D, E, F, C), or 7 for (I, J, K, L), must be added into the usual checksum prior to the modulo for proper identification. For example, supposing that the coded group 3 data matrix is available in an array MSTG, the checksum CK is computed and verified against the stored checksum CKS in FORTRAN as follows:

```
     INTEGER CK,J,I,MSTG(4,8), YEAR, MONTH, BOX2, BOX10, CKS
     CK = 0
     DO 500 J = 1,8
         DO 400 1 = 1,4
             CK = CK + MSTG(I,J)
400 CONTINUE
500 CONTINUE
    CK = CK + YEAR + MONTH + BOX2 + BOX10 + 3
    CK = M0D (CK,4095)
    IF(CK.NE. CKS) THEN
        PRINT*, 'ERROR. CK =',CK,'.NE. CKS =',CKS
        STOP
    ENDIF
```

- standard deviation estimate

Instead of the standard deviation about the mean (statistic 7, s), this robust estimate is provided from the fifth and first sextiles: $e=(s_5-s_1)/2$. (This was computed using integer truncating division on the coded quantity s_5-s_1, i.e., rounding down.) For unpacking purposes, e is treated exactly like the corresponding standard deviation of each respective variable.

- mean day-of-month of observations
  fraction of observations in daylight
  mean hour of observations
  mean longitude of observations
  mean latitude of observations

The centroids of observational location in time and space are shortened in length and precision from their representation in MST and MSU. "Nice" true values are reported for d, h, x, and y using the aforementioned units and base. Because of successive rounding steps, these values actually represent intervals whose trimmed or untrimmed behaviour is shown in Tables B3-2a or B3-2b. The lowest and highest intervals are always exceptions to the behaviour of the central intervals, so these extreme intervals are shown explicitly with the deviation (δ) of the actual midpoint of this interval from the reported true value. Coded values greater than one and less than the maximum coded value correspond to central intervals that can be obtained by subtracting the minus value and adding the plus value to the reported true value, yielding an inclusive lower and exclusive upper bound. The actual midpoint of each central interval can be obtained in any of three ways: by taking the mean of the upper bound and the lower bound, by plugging the basex shown into the usual formula in place of base, or by adding the midpoint deviation (δ) to the reported true value. For example, the intervals and actual midpoints corresponding to true h_u values 1,3,5,...,23 are [0,2.05), [2.05,4.05), [4.05,6.05),...,[22.05,23] and 1.025,3.05,5.05,...,22.525.

Comprehensive Ocean–Atmosphere Data Set; Release 1
Supplement C: Trimming and Related Formats: DSUL.1, TRP.1

0. Introduction

Secs. 1 and 2 define trimming and describe smoothing methods used to derive the Decadal Summary Untrimmed Limits (DSUL). These limits were input to the second statistics pass as a basis for rejecting (trimming) data. Secs. 3 and 4 detail the format for DSUL and for the data that measure Trimming Performance (TRP).

Cross reference is made to supp. A for standardized unpacking information, and the same notation for variables and statistics is followed or extended, also using the same type of two dimensional table presentation.

1. Trimming

In the first statistics pass, the untrimmed monthly and decadal summaries (MSU and DSU) were generated. The untrimmed decadal summaries were used to derive a set of upper and lower limits (DSUL) for the variables S, A, U, V, P, R. In the second statistics pass, each individual observation of one of these variables was ”trimmed” if it fell outside the limits in DSUL. This had the effect of rejecting such an observation from the trimmed monthly and decadal summaries (MST and DST). Since other variables W, Q, D, E, F, G, X, Y, I, J, K, L are all functions of two or more of the explicitly trimmed variables, they were computed only if the variables they depend on survived computation and trimming (see Figure A4–1 in supp. A). Total cloudiness C was not trimmed, and its ”trimmed” and untrimmed statistics would be identical, except for differences in input data (see supp. A).

Bivariate techniques that were considered for trimming the wind vector [U V]’, such as one based on squared statistical distance [4], were abandoned because of their sensitivity to outliers and the infeasibility of multiple passes through the data. Instead, each component was treated exactly like a univariate quantity in trimming, and both (plus the wind magnitude W) were trimmed if either U or V failed.

There are two additional products from trimming. First, individual observations of the explicitly trimmed variables were flagged by their Compressed Marine Reports (see supp. D) to show if they were trimmed as outliers or for other reasons. When an individual observation was trimmed, it was omitted from the trimmed summaries, but was not omitted from CMR. Instead a flag was set in the CMR file, thus making that rile a source of both untrimmed and trimmed data. Second, trimming performance was measured by data described in sec. 4 .

An individual observation a_i of any variable i (i = S,A,U,V,P,R) was trimmed if it fell outside its lower or upper limit:

$$a_i < l_{ipmb} \quad \text{or} \quad a_i > u_{ipmb} \qquad (1)$$

where $_p$ is the final year of the period (1909, 1949, 1979), $_m$ is the month (1,...,12), and $_b$ is the 2° box (1,...,16202) that contain a_i. The three periods,

1854–1909 (6 decades)
1910–1949 (4 decades)
1950–1979 (3 decades)

were chosen to keep the trimming criteria separate, in general, across possible climatic epochs or instrumental and observational discontinuities (see Figure C1–1).

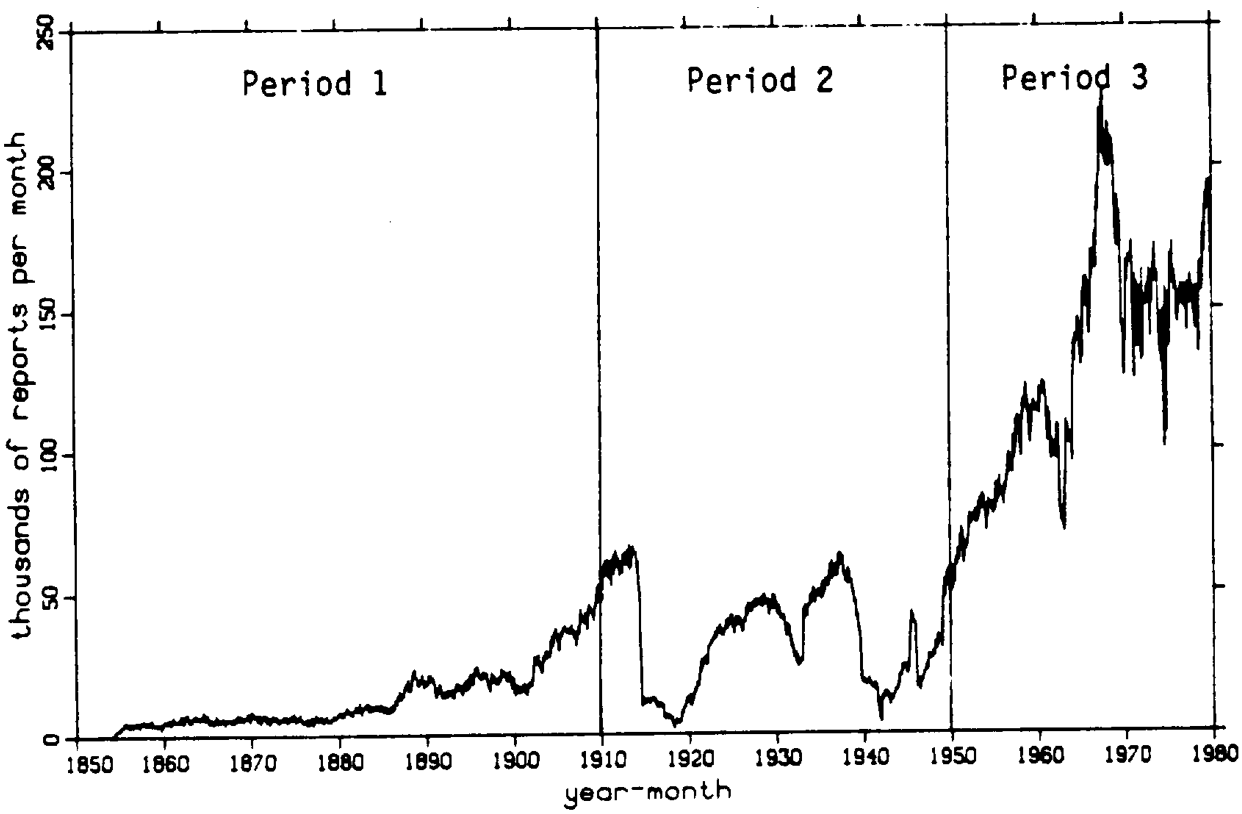

Figure C1-1. Global reports after duplicate elimination, divided into periods that separate limits were established for using untrimmed data.

Further, an individual observation was automatically trimmed if the 2° box was landlocked according to the approximate table given in supp. G , or if the lower and upper limits were missing. Both the values "missing" and "landlocked" are defined in DSUL.

2. Derivation of Smoothed Limits

The lower and upper limits l_{ipmb} and u_{ipmb} (in subsequent material referred to simply as l and u) depend on

i = variable (S, A, U, V, P, R)
p = period (1854–1909, 1910–1949, 1950–1979)
m = month (January,...,December)
b = box (1,...,16202)

They were derived from the 1/6, 3/6 (median), and 5/6 decadal sextiles (s_1,s_3,s_5) in the untrimmed decadal summaries, using smoothing operations across time-related or space-adjacent 2° boxes, within a period, and then applying additional smoothing and other steps to create the final limits contained in DSUL. This extensive smoothing was done to reduce as much as possible the effect of outliers on l and u, since distorted limits might trim out perfectly good observations.

The decadal sextiles (s_1,s_3,s_5) were used as input to the smoothing process because they were considered less sensitive to outliers in the original untrimmed data than a decadal mean m or standard deviation s. The median s_3 is an estimator of m, and the quantities (s_3 – s_1) and (s_5 – s_3), called mdevl and mdevu (for median-deviation-lower and-upper), are estimators of –1s and +1s, respectively. Assuming a normal distribution, the relationship

$$(s_5-s_1)/2 \approx (s_3-s_1) \approx (s_5-s_3) \approx s \qquad (2)$$

tends to equality as random sample-size increases, where e = (s_5 – s_1)/2 is available in group files (supp. B). Otherwise, asymmetry in a distribution may be recognized using (s_3 – s_1) and (s_5 – s_3) separately.

First, each of the DSU data were tested for reasonableness. For the decadal medians. the data were rejected (i.e., set to "landlocked") if the box was located on land. The deviations (s_3 – s_1) and (s_5 – s_3) were rejected if on land or if the number of observations n from which they were derived was less than 3 (the medians s_3 were included for all n > 0).

2.1 Decadal Cubes

A given 2° box, b, together with those boxes adjacent in longitude x and latitude y makes a group of nine, as shown by Figure C2-1 .

	$b - 181$	$b - 180$	$b - 179$
y	$b - 1$	b	$b + 1$
	$b + 179$	$b + 180$	$b + 181$
		x	

Figure C2-1. 2° boxes geographically-contiguous to b. Procedures were modified when b has as its boundary 0° longitude, so as to include the geographically contiguous boxes, or when b is one of the polar or polar-adjacent boxes.

Adding a similar group from the preceding month in the same decade and also one from the following month yields a cube in latitude, longitude, and month, similar to "Rubik's Cube" (Figure C2–2). The decadal cube has 27 possible sets of s_3, (s_3 – s_1) , and (s_5 – s_3), one central set and the others in pairs symmetric about the center.

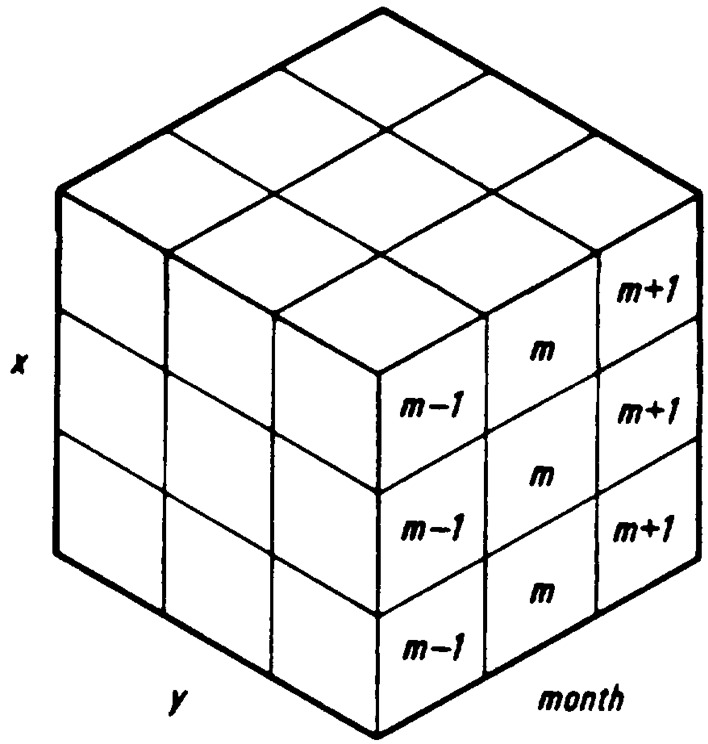

Figure C2-2. Decadal cube example.

For each of the three periods, cubes were constructed around a given central box for each decade in the period (except for the number of decades, the procedure was the same for each variable–period–2° box–month). Let M represent the number of medians (s_3), and N represent the number of deviations ($s_3 - s_1$) and ($s_5 - s_3$), found jointly in all the decadal cubes centered on a box in one period. Thus 162, 108, or 81 is the maximum for M and N, depending on whether the period contains 6, 4, or 3 decades.

Of course M or N may be reduced below the maximum because of missing or landlocked data, and the requirement that deviations have $n > 2$ allows the possibility that $N \leqslant M$. In addition, to preserve spatial or temporal gradients centered in a decadal cube, the symmetric pairs were included only when both members of a pair were present. If one of the pair was missing or landlocked, the other was set to missing.

Three statistics were generated using the surviving M values of s_3, and N sets of ($s_3 - s_1$) and ($s_5 - s_3$):

σ_1 = median of the N values of ($s_3 - s_1$) (3)
g = median of the M values s_3 (4)
σ_5 = median of the N values of ($s_5 - s_3$) (5)

Five was the minimum value permitted for either M or N; otherwise σ_1 and σ_5 together, and possibly also g, were set to missing. Also, if the target box was landlocked, all of σ_1 ,g ,σ_5 assumed the value "landlocked."

2.2 Base Maps

The 216 base maps (6 variables x 3 periods x 12 months) of σ_1 ,g ,σ_5 , were further smoothed and modified in the following six steps, yielding the final smoothed limits:

1) Early period combination

The median g was left fixed in each period. However, because of sparser data and to avoid excessively narrow limits in the earliest two periods σ_1 in both periods were set to the maximum of the two, and likewise with the two σ_5. Letting $\sigma_{j,1909}$ and $\sigma_{j,1949}$,j=1,5 denote the σ_1 and σ_5 values for the periods ending in 1909 and 1949:

$$\sigma_{j,1909} = \sigma_{j,1949} = \max(\sigma_{j,1909}, \sigma_{j,1949}) \quad (6)$$

Landlocked boxes were ignored, but a missing box could be replaced by an extant value from the other period.

2) Cutoff criteria on g

Table C2-1 sets cutoff values on the median g. Any g below the lower cutoff or above the upper cutoff, depending on variable and latitude position, was set to missing.

Table C2-1
Cutoffs on Median g

Latitude	S		A		U and V		P		R	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
$60° < \|y\| \leq 90°$	-3	20	-45	25	-10	15	950	1050	0	100
$30° < \|y\| \leq 60°$	-3	30	-15	35	-10	15	950	1050	0	100
$0° \leq \|y\| \leq 30°$	10	35	10	40	-10	15	950	1050	0	100
Units:	°C		°C		ms^{-1}		mb		%	

3) Replacement criteria for $3.5\sigma_1$ and $3.5\sigma_5$

So as to increase σ_1 and σ_5 to the chosen trimming magnitude, σ_1 and σ_5 were multiplied by 3.5. This factor of 3.5 was chosen to reject as few as possible of genuine data, but to reject outliers. In normally distributed data, only 1 observation in 2500 would fall outside such limits. Any $3.5\sigma_1$ or $3.5\sigma_5$ that was less than or greater than the allowable lower or upper bound shown in Table C2-2 , denoted by or Σ_l or Σ_u was replaced by the violated bound:

$$3.5\sigma_1 = \max(\min(3.5\sigma_1, \Sigma_u), \Sigma_l) \quad (7)$$

$$3.5\sigma_5 = \max(\min(3.5\sigma_5, \Sigma_u), \Sigma_l) \quad (8)$$

Table C2-2
Replacements for Median Deviation
Multiples $3.5\sigma_1$ and $3.5\sigma_5$

Latitude	S		A		U and V		P		R	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
$60° < \lvert y\rvert \leq 90°$	1.5	15	3	30	5	40	10	70	10	50
$30° < \lvert y\rvert \leq 60°$	1.5	15	3	30	5	40	10	70	10	50
$0° \leq \lvert y\rvert \leq 30°$	1.5	15	3	30	2	30	5	40	10	50
Units:	°C		°C		ms^{-1}		mb		%	

4) Computation of l and u

The lower and upper limits (l and u) for a given box were computed only if σ_1 ,g ,and σ_5 were all present. During this computation, extreme values possible for l, g, and u were adjusted to fall within the lower and upper bounds given by Table C2-3 , as follows:

$$g = \max(\min(g, upper - \Sigma_l), lower + \Sigma_l) \quad (9)$$
$$l = \max(g - 3.5\sigma_1, lower \quad (10)$$
$$u = \min(g + 3.5\sigma_5, upper) \quad (11)$$

Table C2-3
Extreme Bounds

Latitude	S		A		U and V		P		R	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
$0° \leq \lvert y\rvert \leq 90°$	-3	40	-50	50	-50	50	920	1060	0	100
Units:	°C		°C		ms^{-1}		mb		%	

(5) Zonal smoothing

A 1–2–1 smoother was wrapped non–recursively around each latitude zone of l, g, and u. That is, when all three values adjacent in longitude were present, a smoothed value for the center was calculated as the mean of the three, with the central value given double weight. When any of the three values was missing or landlocked, the central value was left unchanged. For example, given the two 2° boxes (containing l_{-1} and l_{+1}) adjacent to a central box (containing l) the smoothed value is

$$l = (1l_{-1} +2l +1l_{+1})/4 \qquad (12)$$

6) Zonal extension

With the rules described so far, many observations isolated in either time or space would not have enough nearby observations to determine limits, and so would be suppressed. For this reason, each 2° latitude zone of l, g, and u was extended across missing boxes by a process of interpolation or extrapolation. A threshold of five missing boxes (10° of longitude) was set such that, for a gap consisting solely of missing data:

- a gap of ≤ 10 missing boxes between two extant data (i.e., five on either side) was filled by linear interpolation, or

- a gap of ≤ 5 missing boxes from one extant datum to a missing or landlocked box was filled by extrapolation.

3. Decadal Summary Untrimmed Limits (DSUL)

The limits derived from DSU as described in sec. 2 were input to the second statistics pass to serve as limits for rejecting (trimming) data. Table C3–1a shows the bit layout of each DSU and Table C3–1b shows the bit layout of each of its 48–bit sections, in sequential bit order reading from top to bottom.

Table C3–1a
DSUL.1

#	β	Variable	Bits
		rptin	16
		10° box	10
		month	4
		2° box	14
		period	8
		checksum	12
1	S	sea surface temperature	48
2	A	air temperature	48
4	U	vector wind eastward component	48
5	V	vector wind northward component	48
6	P	sea level pressure	48
9	R	relative humidity	48
		unused	32
		total	384

Table C3–1b
48–bit Sections

#	α	Statistic	Bits
16	l	smoothed lower limit	16
17	g	smoothed median	16
18	u	smoothed upper limit	16
		total	48

3.1 Reconstruction of Floating Point Data

The coded and true value ranges, the units. and the base of all these fields are common to the monthly summaries, with characteristics as given in sec. 2.3 of supp. A , except that the following fields have different names and other differences as noted:

- period

  This contains the final year of the period, i.e., 1909, 1949, or 1979, so that the statistics program can test for year > period. For unpacking purposes, period is treated exactly like year.

- smoothed lower limit ($g - 3.5\sigma_1$)
  smoothed median
  smoothed upper limit ($g - 3.5\sigma_5$)

  The lower and upper limits were set at the multiple 3.5 of the smoothed lower or upper median deviation around the smoothed median. For unpacking purposes, these three are treated exactly like the corresponding median of each respective variable, with one exception: the value 2^{16} – 2 (65,534) indicates a landlocked 2° box for which no limits triplet is provided (for any variable). These limits may also be missing in triplets, indicating that the 2° box is not landlocked but no limits were available for that variable. It is also permissible for the limits for U to be missing but not those for V, or vice versa. Otherwise, an individual CMR (supp. E) observation < l or observation > u was trimmed. Note that the limits were extended in precision by one decimal place over the observations.

3.2 Blocking Structure

Seventy–five DSUL were put together into a block of 28,800 bits. Their sort is by the following keys in succession:

10° box, month, 2° box, period.

Therefore, each ordinary block contains exactly one month (because 3 periods * 25 BOX2 = 75), and 12 blocks compose one 10° box.

For the two polar 10° boxes, BOX10–1 and BOX10–648, two blocks are needed to represent each month. This is because each of these 10° boxes contains 26 2° boxes: BOX2–1 is at the beginning of BOX10–1, followed by BOX2–17; and BOX2–16202 is at the end of BOX10–648, preceded by BOX2–16036. So that all blocks will be the same length, the three polar DSUL for each month (one for each period) were put in a block by themselves followed by 72 records of binary–zero fill. These zero–filled blocks are interleaved with the ordinary blocks in a polar 10° box in order to achieve the proper sort order, resulting in riles 1 and 648 being twice as long as files 2 through 647.

Figures C3–1 through C3–3 illustrate the three different monthly structures that occur.

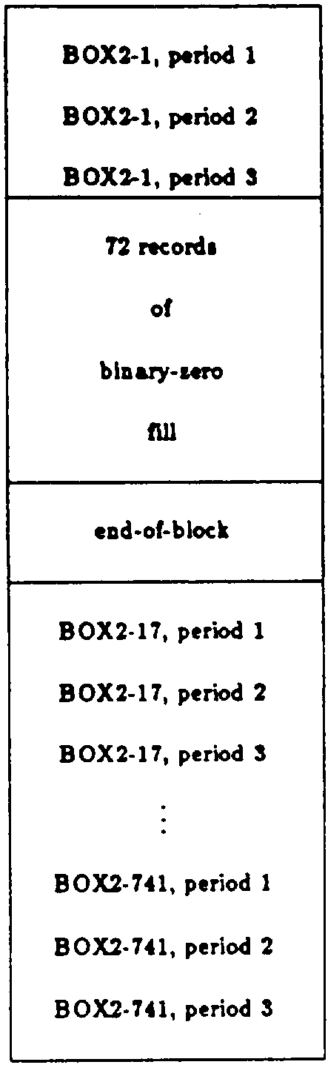

Figure C3-1.
BOX10-1
monthly structure.

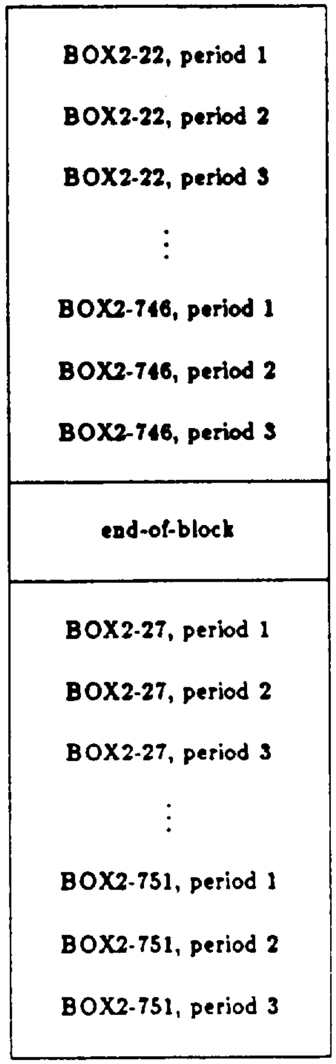

Figure C3-2.
BOX10-2 and -3
monthly structure
(similar for
BOX10-4
through -647).

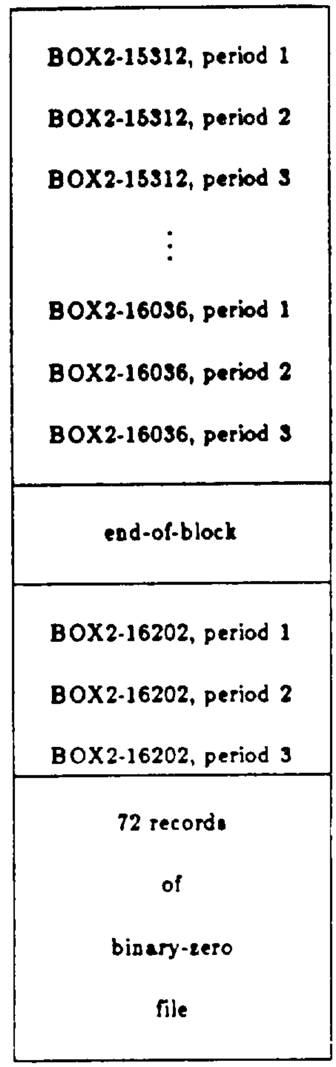

Figure C3-3.
BOX10-648
monthly structure.

4. Trimming Performance (TRP)

This format gives detailed information, for each year–month–2° box and for each explicitly trimmed variable (S, A, U, V, P, and R), of the number of observations input, and the number trimmed for being above or below the limits provided by DSUL. Special configurations count the number of observations automatically rejected when no limits are provided or where a 2° box is landlocked. Thus a TRP was output if and only if a year-month-2° box contained at least one observation of one or more of the explicitly trimmed variables. Table C4-1a shows the bit layout of each TRP and Table C4-1b shows the bit layout of each of its 72-bit or 60-bit sections, in sequential bit-order reading from top to bottom.

Table C4-1a
TRP-1

#	β	Statistic	Bits
		rptin	16
		year	8
		month	4
		2° box	14
		10° box	10
		checksum	12
19	n_i	number of observations input	72
20	n_l	number of observations lower-trimmed	60
21	n_u	number of observations upper-trimmed	60
		total	256

Table C4- 1b
72-bit or 60-bit Sections

#	β	variable	Bits	Bits
1	S	sea surface temperature	10	12
2	A	air temperature	10	12
4	U	vector wind eastward component	10	12
5	V	vector wind northward component	10	12
6	P	sea level pressure	10	12
9	R	relative humidity	10	12
		total	60	72

4.1 Reconstruction of Floating Point Data

The coded and true value ranges, the units, and the base of all these fields are common to the monthly summaries, with characteristics as given in sec. 2.3 of supp. A , except that the following fields have different names and other differences as noted:

- number of observations input
  number of observations lower-trimmed
  number of observations upper-trimmed

These statistics have the same properties as n in the monthly summaries, except that the coded (and true value being the same) ranges are reduced to: 1 ≤ 4095 and 1×≤×1023 for the 12 and 10 bit fields, respectively.

For each of the univariates (S, A, P, R) the total number trimmed is $n_t = n_l + n_u$ and the number output is $n = n_i - n_t$, (identical with n in the corresponding MST). For the bivariate [U V]′ the total number trimmed is $n_t = n_l U + n_u U + n_l V + n_u V$, where the notation $\alpha\beta$ has its usual meaning, and $n_i U = n_i V$. In this case the order tests are made in gives a special meaning to the statistics for [U V]′ :

a) first, any observation with U < lU is counted by n_l U,
b) any survivor of a) with U > uU is counted by n_uU,
c) any survivor of b) with V < lV is counted by n_l V,
d) any survivor of c) with V > uV is counted by n_u V.

Either n_l or n_u (not both) greater than 0 in conjunction with n_i 0 has a completely different meaning from that stated previously. Where the 2° box is landlocked, n_l with n_i. 0 counts the number of observations input and automatically rejected. Otherwise, when no limits are provided. n_u with n_i 0 counts the number of observations input and automatically rejected. For [U V]′ landlocked only n_l U is set —— n_u U,n_l V, and n_u V should be 0. Similarly, only n_u U is set if the limits for U are missing, or only n_u V is set if the limits for V are missing but those for U are not. These rules preserve the properties of the preceding equations for n_t, if one desires to include in n_t those observations landlocked or with missing limits.

Comprehensive Ocean–Atmosphere Data Set; Release 1

Supplement D: Compressed Marine Reports, Format CMR.5

0. Introduction

CMR.5 is a packed binary format designed as a compact alternative* to LMR (Long Marine Reports), The National Climatic Data Center's TD–11 (Tape Deck–11), or other formats, containing some of the most frequently used variables. Each report has the internal structure given in Table D0–1 . 192 bits was chosen as the minimum number of bits needed to represent the fields of interest, as well as being divisible by 16–, 32–, and 64–bit word sizes. 192 bits is also one–sixth the size of a 148–character TD–11 representation (given 8–bit character size).

* CMR.6 supersedes CMR–4 (described In supp. E). The material In supp. E has been retained only for reference and includes details on translation from LMR (supp. F). The only omission from CMR.5 is

the recorded wind speed, Because of rounding in the calculation of coded U and V, it can be only approximated by $(U^2 + V^2)^{1/2}$.

It is assumed that the reader is familiar with techniques for transferring a binary block into memory and then extracting into INTEGER variables the bit strings whose lengths are given in Table DO–1 . Refer to supp. H for more information. For a general discussion including the advantage in execution time and storage relative to traditional techniques see [3].

Compression was achieved by packing data represented as positive integers into fields whose lengths are specified in the bits column of Table DO–1 . To accomplish this, a field's floating point true value (within the range of that column) was divided by the appropriate units (the smallest increment of the data that has been encoded). After rounding, the base was subtracted to produce a coded positive integer (within the range of that column), which was finally right justified with zero fill in the field's position within the report. Using the sea surf ace temperature (field 9) true value 28.6°C as an example, (28.6/0.1) – (–51) = 337.

Once a given field has been extracted into a coded value, the true value can be reconstructed by reversing the process:

true value = (coded + base) units*

The above true value example is reconstructed by (337 + (–51)) * 0.1) = 28.6°C. NOTE: in each coded value, zero is reserved as an indicator of missing data. Of course, none of BOX10, MONTH, BOX2, YEAR, X, or Y should ever be missing, although DAY and HOUR may be missing.

Explanations for each field in Table DO–1 are given under the corresponding headings that follow, where all information refers to the true value (unless explicit mention is made to the contrary), and some reference is made to TD–11 [5], [6], [7] or LMR (supp. F) documentation. The various indicators and flags show the reliability or precision of the data they refer to, and may be extant only if the data are also non–missing. Algorithms are expressed in FORTRAN.

Table D0-1
CMR.5

#	Field	Description	True value	Units*	Base	Coded	Bits
		Location					
1	BOX10	10° box	1≤ 648**	1***	0	same	10
2	MONTH		1≤ 12	1	0	same	4
3	BOX2	2° box	1≤ 16202	1	0	same	14
4	YEAR		1800≤ 2054	1	1799	1≤ 255	8
5	DAY		1≤ 31	1	0	same	5
6	HOUR		0≤ 23	1	-1	1≤ 24	5
7	X	lon (from BOX2	0≤ 2.0	0.1°	-1	1≤ 21	5
8	Y	lat SW corner)	0≤ 2.0	0.1°	-1	1≤ 21	5
						sub-total	56
		Temperature					
9	S	sea surface temperature	-5.0≤ 40.0	0.1 °C	-51	1≤ 451	9
10	BI	bucket indicator	0≤ 2	1	-1	1≤ 3	2
11	A	air temperature	-88.0≤ 58.0	0.1 °C	-881	1≤ 1461	11
12	DP	dew point depression	0≤ 70.0	0.1 °C	-1	1≤ 701	10
13	TI	temperature indicator	0≤ 5	1	-1	1≤ 6	3
						sub-total	35
		Wind					
14	U	eastward component	-102.2≤ 102.2	0.1 m s^{-1}	-1023	1≤ 2045	11
15	V	northward component	-102.2≤ 102.2	0.1 m s^{-1}	-1023	1≤ 2045	11
16	DI	direction indicator	0≤ 5	1	-1	1≤ 6	3
17	WI	wind speed indicator	0≤ 1	1	-1	1≤ 2	2
						sub-total	27
		Pressure and clouds					
18	P	sea level pressure	870.0≤ 1074.6	0.1 mb	8699	1≤ 2047	11
19	C	total cloud amount	0≤ 9	1	-1	1≤ 10	4
20	NH	lower cloud amount	0≤ 9	1	-1	1≤ 10	4
21	CL	low cloud type	0≤ 10	1	-1	1≤ 11	4
22	H	cloud height	0≤ 10	1	-1	1≤ 11	4
23	HI	cloud height indicator	0≤ 1	1	-1	1≤ 2	2
24	CM	middle cloud type	0≤ 10	1	-1	1≤ 11	4
25	CH	high cloud type	0≤ 10	1	-1	1≤ 11	4
						sub-total	37
		Misc.					
26	ST	ship type	0≤ 7	1	-1	1≤ 8	4
27	PW	present weather	0≤ 99	1	-1	1≤ 100	7
28	CD	card deck	0≤ 999	1	-1	1≤ 1000	10
						sub-total	21
		Flags					
29	LF	landlocked flag	0≤ 0	1	-1	1≤ 1	1
30	SF	SST flag	0≤ 2	1	-1	1≤ 3	2
31	AF	air temperature flag	0≤ 2	1	-1	1≤ 3	2
32	RF	relative humidity flag	0≤ 2	1	-1	1≤ 3	2
33	WF	wind flag	0≤ 2	1	-1	1≤ 3	2
34	PF	pressure flag	0≤ 2	1	-1	1≤ 3	2
						sub-total	11
35	CK	checksum	n/a	n/a	n/a	n/a	5
						total	192

* "Units" gives the smallest increment of the data that has been encoded. Thus a change of one unit in the integer *coded* value represents a change in the *true value* of one of the units shown.
** m≤ n denotes "from m through n inclusive."
*** Units of 1 are explained in the text.

1. Fields

1) BOX10 10° box

See supp. G for a description of the 10° box system, and supp. H for related software.

2) MONTH
1 = January, 2 = February, ..., 12 = December.

3) BOX2 2° box

See supp. G for a description of the 2° box system, and supp. H for related software.

4) YEAR

The year can range from 1800 to 2054.

5) DAY

Day of the month.

6) HOUR

00 to 23 GMT.

7) X longitude

8) Y latitude

Position in tenths of a degree measured from the SW (lower-left) corner of the BOX2. Range is from 0 to 2.0 subject to the boundary constraints of a BOX2:

a) Boxes in the NE quadrant have 0 ⩽ X < 2.0, 0 ⩽ Y < 2.0 (except if box E boundary is 180° E, 0×⩽×X×⩽×2.0).

b) Boxes in the NW quadrant have 0 < X ⩽2.0, 0×⩽×Y×<×2.0 (except if box W boundary is 180° E, 0 ⩽×X×⩽×2.0).

c) Boxes in the SE quadrant have 0 ⩽×X <×2.0, 0 <×Y ⩽ 2.0 (except if box E boundary is 180° E, 0 ⩽×X×⩽×2.0).

d) Boxes in the SW quadrant have 0 < X ⩽2.0, 0 <×Y ⩽ 2.0 (except if box W boundary is 180° E, 0 ⩽×X×⩽×2.0).

e) Boxes 1 and 16202 have X and Y (by convention) equal 0 always.

9) S sea surface temperature

10) BI bucket indicator

Temperature S in tenths of a degree Celsius. BI shows the method by which S was taken:

- 0 = unknown
- 1 = bucket
- 2 = implied bucket (an BSST source or any match thereof)

NOTE: BI values 0 and 1 are unreliable at least for U.S. recruited ships (i.e., country code OK or 02) until starting on 1 May 1973, or perhaps earlier (see COADS Release 1, and for country codes see [6].

11) A air temperature

12) DP dew point depression

Temperatures A and DP in tenths of a degree Celsius. Let DPT denote dew point temperature.
Dew point depression is defined as

DP = A – DPT

13) TI temperature indicator
Shows the precision and units that S, A, and DP were recorded in or later translated to (see supp. I):

- 0 = degrees Celsius and tenths
- 1 = whole degrees Celsius
- 2 = half degrees Celsius
- 3 = degrees Fahrenheit and tenths
- 4 = whole degrees Fahrenheit
- 5 = half degrees Fahrenheit

14) U vector wind eastward component

15) V vector wind northward component

U and V were computed to tenths of a meter per second, using the wind direction in degrees

(D) and wind speed in tenths of a meter per second (W) as follows:

```
ANG = D*(3.14159265359/180.)
U =  W*SIN(ANG)
```

V = W*COS(ANG)

(Supp. F describes how the original compass reading was translated into whole degrees.)

16) DI direction indicator

DI shows the compass (and approximate precision) used to report the direction contributing to U and V:

0 = 36-point compass
1 = 32-point compass
2 = 16 of 36-point compass
3 = 16 of 32-point compass
4 = 8-point compass
5 = 360-point compass

17) WI wind speed indicator

WI shows if the wind speed was:

0 = estimated (or unknown method of observation)
1 = measured

18) P sea level pressure

In tenths of a millibar.

19) C total cloud amount
20) NH lower cloud amount
21) CL low cloud type
22) H cloud height
23) HI cloud height indicator
24) CM middle cloud type
25) CH high cloud type

Except for HI, the cloud fields 19)-25) have possible codes 0 to 9 as given by TD-11, or a 10 corresponding to the minus sign given therein for CL, H, CM, and CH. Alternately, see supp. F for these definitions. HI shows if H was:

0 = estimated
1 = measured

26) ST ship type

The type of observing vessel was obtained according to supp. I , and the unreliability of this field is discussed in *COADS Release 1*.

0 = U.S. Navy or "deck" log, or unknown
1 = merchant ship or foreign military
2 = ocean station vessel off station or station proximity unknown
3 = ocean station vessel on station
4 = lightship
5 = buoy
6 = research ship
7 = expendable or mechanical bathythermograph (XBT or MBT)

27) PW present weather

Codes 0 to 99 as given by TD–11 or supp. F .

28) CD card deck

Number of the source card deck the report came from, as assigned by NCDC and described in supp. F .

29) LF landlocked flag
30) SF sea surface temperature (S) flag
31) AF air temperature (A) flag
32) RF relative humidity (R) flag
33) WF wind (W, U, V) flag
34) PF pressure (P) flag

The flags 29)–34) show whether the variables they refer to were trimmed (i.e., excluded from the summaries but retained in CMR) as apparent statistical outliers or for other reasons.

The flag LF has (NOTE: distinct from the usual coded 0 for missing) one possible extant true value:

0 = landlocked

indicating that the 2° box is landlocked according to the landlocked rile described in supp G . In this case, the other flags (SF, AF, RF, WF, PF) are all missing and any data were automatically trimmed because trimmed summaries were generated only for reports with LF missing. If LF is missing, the other flags may still be missing or else carry one of the following values:

0 = $g - 2.8\sigma_1 \leq a_i \leq g + 2.8\sigma_5$ (not trimmed)
1 = $g - 3.5\sigma_1 \leq a_i \leq g + 3.5\sigma_5$ (not trimmed)
2 = $a_i < \times g - 3.5\sigma_1$ or $a_i > \times g + 3.5\sigma_5$ $\times$(trimmed)

where a_i is an individual observation of the variable under scrutiny, g is the smoothed median, and σ_1 and σ_5 are the smoothed lower and upper median deviation. The computation and format of these smoothed limits is described in supp. C .

If LF is missing, other flags set to missing indicate either that the smoothed limits are missing, and thus the variables referred to were automatically trimmed, or that the variables are missing. Thus missing flags must be evaluated in conjunction with the actual variables (tile special case of RF is discussed in the following).

Assignment of the flags SF, AF, and PF was accomplished as follows:

a) If the 2° box was landlocked, the flag was set to missing.

b) If the smoothed limits were missing, the flag was set to missing.

c) If the variable was missing, the flag was set to missing.

d) If the variable fell within the narrow interval $(g - 2.8\sigma_1 \leqslant a_i \leqslant g + 2.8\sigma_5)$, the flag was set to 0 and the variable was included in the summaries.

e) If the variable fell within the wide interval $(g - 3.5\sigma_1 \leqslant a_i \leqslant g + 3.5\sigma_5)$, the flag was set to 1 and the variable was included in the summaries.

f) Otherwise, the flag was set to 2 and the variable was trimmed from the summaries because it fell outside the wide interval.

Assignment of WF depended jointly on U and V, but followed the same basic rules. was tested against its limits first, and then V was tested against its limits, retaining the maximum flag value found in the separate tests for U and V. In case either the limits for U or V were missing, or both, the flag was set to missing. As a result, all three wind variables (U, V) and W (wind speed) were included in the summaries only if WF had a value 0 or 1.

Assignment of RF was a special case only because relative humidity does not appear directly, and depends on A (air temperature) and DP (dew point depression). To handle this dependence, AF was assigned first. Only if AF then had a value 0 or 1 and DP was extant could R be computed; otherwise R was considered missing.

35) CK checksum

A checksum was computed and stored with each report as a measure of reliability during storage and transmission. The checksum is computed by

1) Summing coded values of all other fields in the report besides the checksum.

2) Obtaining the modulo $(2^5 - 1)$ of the sum.

Repeating this calculation for every unpacked report, and then verifying that the checksum so obtained agrees with the coded checksum stored in the report, is strongly encouraged. For example, supposing that the coded values of the preceding 34 fields are available in an array FIELD, the checksum CK is computed and verified against the stored checksum CKS in FORTRAN as follows:

```
    INTEGER CK,J,FIELD(34)., CKS
    CK = 0
    DO 500 J = 1,34
500 CK = CK + FIELD(J)
    CK = MOD(CK, 31)
    IF (CK NE. CKS) THEN
       PRINT*, 'ERROR. CK = ',CK,'.NE. CKS =',CKS
       STOP
    ENDIF
```

Note that using modulus 2^5–1 takes into account every bit of CK, versus chopping at the sixth bit using modulus 2^5

Comprehensive Ocean–Atmosphere Data Set; Release 1

Supplement E: Compressed Marine Reports, Format CMR.4

0. Introduction

CMR.4 has been superseded by CMR.5 (described in supp. D). The material herein has been retained only for reference and includes details on translation from LMR (supp. F). The only omission from CMR.5 is the recorded wind speed. Because of rounding in the calculation of coded U and V, it can be only approximated by $(U^2 + V^2)^{1/2}$.

Table EO–1 gives the internal structure of each CMR.4 report. Except for the differences given there and in sec. 1, CMR.4 is identical to CMR.5.

Table E0-1
CMR.4

#	Field	Description	True value	Units*	Base	Coded	Bits
		Location					
1	BOX10	10° box	1≤ 648**	1***	0	same	10
2	MONTH		1≤ 12	1	0	same	4
3	BOX2	2° box	1≤ 16202	1	0	same	14
4	YEAR		1800≤ 2054	1	1799	1≤ 255	8
5	DAY		1≤ 31	1	0	same	5
6	HOUR		0≤ 23	1	-1	1≤ 24	5
7	X	lon (from BOX2	0≤ 2.0	0.1°	-1	1≤ 21	5
8	Y	lat SW corner)	0≤ 2.0	0.1°	-1	1≤ 21	5
						sub-total	56
		Temperature					
9	S	sea surface temperature	-5.0≤ 40.0	0.1 °C	-51	1≤ 451	9
10	BI	bucket indicator	0≤ 2	1	-1	1≤ 3	2
11	A	air temperature	-88.0≤ 58.0	0.1 °C	-881	1≤ 1461	11
12	DP	dew point depression	0≤ 70.0	0.1 °C	-1	1≤ 701	10
13	TI	temperature indicator	0≤ 5	1	-1	1≤ 6	3
						sub-total	35
		Wind					
14	W	wind speed	0≤ 102.2	0.1 m s^{-1}	-1	1≤ 1023	10
15	WI	wind speed indicator	0≤ 1	1	-1	1≤ 2	2
16	U	eastward component	-102.2≤ 102.2	0.1 m s^{-1}	-1023	1≤ 2045	11
17	V	northward component	-102.2≤ 102.2	0.1 m s^{-1}	-1023	1≤ 2045	11
18	DI	direction indicator	0≤ 5	1	-1	1≤ 6	3
						sub-total	37
		Pressure and clouds					
19	P	sea level pressure	870.0≤ 1074.6	0.1 mb	8699	1≤ 2047	11
20	C	total cloud amount	0≤ 9	1	-1	1≤ 10	4
21	NH	lower cloud amount	0≤ 9	1	-1	1≤ 10	4
22	CL	low cloud type	0≤ 10	1	-1	1≤ 11	4
23	H	cloud height	0≤ 10	1	-1	1≤ 11	4
24	HI	cloud height indicator	0≤ 1	1	-1	1≤ 2	2
25	CM	middle cloud type	0≤ 10	1	-1	1≤ 11	4
26	CH	high cloud type	0≤ 10	1	-1	1≤ 11	4
						sub-total	37
		Misc.					
27	ST	ship type	0≤ 7	1	-1	1≤ 8	4
28	PW	present weather	0≤ 99	1	-1	1≤ 100	7
29	CD	card deck	0≤ 999	1	-1	1≤ 1000	10
						sub-total	21
30	CK	checksum	n/a	n/a	n/a	n/a	6
						total	192

* "Units" gives the smallest increment of the data that has been encoded. Thus a change of one unit in the integer *coded* value represents a change in the *true value* of one of the units shown.
** m≤ n denotes "from m through n inclusive."
*** Units of 1 are explained in the text.

1. Fields

All fields in CMR.4 are identical in content with the corresponding fields in CMR.5, except for the following:

14) W wind speed

Wind speed is stored in tenths of a meter per second.

30) CK checksum

A checksum was computed and stored with each report as a measure of reliability during storage and transmission. The checksum is computed by

1) Summing coded values of all other fields in the report besides the checksum.

2) Obtaining the modulo ($2^6 - 1$) of the sum.

Repeating this calculation for every unpacked report, and then verifying that the checksum so obtained agrees with the coded checksum stored in the report, is strongly encouraged. For example, supposing that the coded values of the preceding 29 fields are available in an array FIELD, the checksum CK is computed and verified against the stored checksum CKS in FORTRAN as follows:

```
    INTEGER CK, J, FIELD(29),CKS
    CK = 0
    DO 500 J = 1,29
500 CK = CK + FIELD(J)
    CK = MOD(CK, 63)
    IF (CK. NE. CKS) THEN
       PRINT*, 'ERROR. CK = ',CK, '.NE. CKS ',CKS
       STOP
    ENDIF
```

Note that using modulus $2^6 - 1$ takes into account every bit of CK, versus chopping at the sixth bit using modulus 2^6

2. Translation of LMR.5 into CMR.4

Two separate translations of LMR.5 into CMR.4 were actually performed, resulting in two slightly different versions of the data, both stored as CMR.4. The first version was used to compute the untrimmed monthly and decadal summaries. Subsequently, a few errors in LMR (or in translation from LMR) were fixed in a second version of the data prior to its use in generating the trimmed summaries. Given here are rules for the first translation, followed by comments and differences in the second translation.

2.1 First Translation

The CMR set contains only reports with a dup status less than three; i.e., all possible dups have been deleted. Refer to supp. K for more information on dup status, and supp. J for a definition of the following quality control flags.

Because of the format similarities, very little action was required in translating individual fields from LMR into CMR. Fields whose CMR writeup number follows required one of three different types of action in translation. First, some fields do not exist in LMR and were computed. Second, some field bit-lengths are shorter in CMR; those values that do not map into the reduced bit-length are termed "outliers." Third, since no room is available in CMR for quality control flags, a selection of flags was used to eliminate erroneous data.

Out of the first eight fields, only DAY and HOUR may be missing; otherwise the report was discarded altogether. Other missing fields were transferred without change; this implicitly discarded a present weather, pressure, air, dew point, or sea surface temperature with Flag M (data so garbled that they would not fit into the regular section of LMR). Otherwise, extant data were included subject to the following conditions:

3) BOX2 2° box number

Computed. Because of the 30° offset and the polar conventions, BOX10–1 and –648 contain 26 BOX2, e.g., BOX10–1 contains BOX2 numbers 1, 17, 18, ...

7) X longitude

8) Y latitude

Position measured from BOX2 lower–left (SW) corner.

9) s sea surface temperature

Flag Q or outlier discarded.

10) BI bucket indicator
There were no outliers defined.

11) A air temperature

Flag Q, N, or outlier discarded.

12) DP dew point depression
Flags Q and N (of dew point temperature), missing or discarded A, or outlier after computation of DP discarded.

13) TI temperature indicator

There were no outliers defined.

14) W wind speed
15) WI wind speed indicator
16) U vector wind eastward component
17) V vector wind northward component

For WI, no distinction was made between meters per second and knots. Thus 2 in LMR translated into 0 in CMR and 3 translated into 1. Table E2–1 gives the wind flag values possible at different W and wind direction D, with the action taken for each flag in translation.

Table E2-1
Flag Values Possible and Translation Action*

Wind speed	Wind direction 1°≤ D≤ 360°	361(calm)	362(variable)	Missing	Illegal
W=0 m s^{-1}	(D=361) A,J, or M (U,V)=0	R or J (U,V)=0	(D=361) A or J (U,V)=0	(D=361) A or J (U,V)=0	M (W)
0.1≤ W≤ 3.1	R or J (U,V)	(D=362) A or J (W)	R or J (W)	(D=362) A or J (W)	M (W)
3.2≤ W≤ 102.2	R or J (U,V)	(D=360°) A or J (U,V)	J (W)	M (W)	M (W)
Missing	M	(W=0 m s^{-1}) A or J (U,V)=0	M	S	M
Illegal	M	M	M	M	M

* The change made so that the direction D and speed W would be consistent is given above some flags; Flag A is always one of these. Beneath each flag is the resulting (U,V), W if only it results, or blank if all are missing. The Flag M in the upper-left corner is an exception because for it all of (U,V) and W become missing, whereas for Flag A or J the rules are as stated. Besides this exception, any 0≤ W≤ 102.2 m s^{-1} is accepted; this is more restrictive than the Flag Q, and accepts four other Flags M.

---

19) P sea level pressure

Flag Q discarded.

After the aforementioned field discards had been made these further restrictions were applied: indicators referring to discarded data were discarded, and any report with no extant data besides the location, ship type, and card deck was discarded altogether.

2.2 Second Translation

Only differences from the first translation, or comments on the impact of changes to LMR are presented. Otherwise the translation process was the same.

11) A air temperature

Under certain conditions, some (source Exchange) HSST air temperatures had been inadvertently overwritten by barometric tendency during QC. This was fixed before the second translation, but the untrimmed summaries of air temperature were contaminated to an unknown extent. In addition, this error had unknown side-effects on the computation of dew point depression.

12) DP dew point depression

GTS data carry dew point temperature DPT rounded to 1° C and air temperature A to 0.1° C. At or near saturation a rounded DPT might exceed A, causing A and DP to be discarded in the first translation because A and DPT were flagged N. Other small computational problems, such as roundoff errors in Australian (deck 900) and (source Exchange) HSST negative DPT, had a similar effect. These problems all biased the untrimmed summaries, particularly against saturation DP, to an unknown extent. To fix them, QC was changed to give 0.5° C tolerance on all N tests among the temperatures, and the computation of DP was changed to yield zero for $-0.5 \leqslant A - DPT < 0$.

Comprehensive Ocean–Atmosphere Data Set; Release 1 15 May 1985
Supplement F: Long Marine Reports, Format LMR.5

0. Introduction

LMR.5 is a hybrid format, packed binary plus characters, designed for efficient reexpression of ocean surface data from the National Climatic Data Center's TD–11 (Tape Deck 11) or other formats. Packed binary methods are employed to store information common to all of TD–11, to which a variable–length string of characters is appended to represent the remainder. This is the complete report format, containing all available fields, supplemental data from original formats (e.g., elements that underwent a questionable conversion), and erroneous characters, as well as "uncertain" duplicates. It has an attachment feature that would allow easy expansion (to add derived data) or contraction (to fix the length) of a report. Nevertheless, it averages roughly one–half the size of a less complete 148–character TD–11 representation (given 8–bit character size).

It is assumed that the reader is familiar with techniques for transferring a binary block into memory and then extracting into INTEGER variables the bit strings whose lengths are given in Tables FO–1 through FO–4 . Refer to supp. B for more information. For a general discussion including the advantage in execution time and storage relative to traditional techniques see

Table FO–1
Location Section

#	Field	Description	True value	Units*	Base	Coded	Bits
0	RPTIN		n/a	n/a	n/a	n/a	16
1	BOX10	10° box	1≤648**	1***	0	same	10
2	YEAR		1800≤2054	1	1799	1≤ 255	8
3	MONTH		1≤12	1	0	same	4
4	DAY		1≤31	1	0	same	5
5	HOUR		0≤23	1	–1	1≤24	5
6	X	lon	0≤359.9	0.1° E	–1	1≤3600	12
7	Y	lat	–90.0≤90.0	0.1° N	–901	1≤1801	11
8	XYI	lat/lon indic.	0≤3	1	–1	1≤4	3
9	CD	card deck	0≤999	1	–1	l≤1000	10
10	SID	source ID	0≤254	1	–1	1≤255	8
11	ST	ship type	0≤7	1	–1	1≤8	4
12	QI	quality indic.	0≤2	1	–1	1≤3	2
13	DS	dup status	0≤5	1	–1	1≤6	3
14	DC	dup check	0≤2	1	–1	1≤3	2
15	TC	track check	0≤1	1	–1	1≤2	3
16	PB	pressure bias	0≤2	1	–1	1≤3	2
					section total		108

* "Units" gives the smallest increment of the data that has been encoded. Thus a change of one unit in the integer coded value represents a change in the true value of one of the units shown.

** m ⩽ n denotes "from m through n inclusive."
*** Units of 1 are explained in the text describing each section.

Table F0-2
Regular Section

#	Field	Description	True value	Units	Base	Coded	Bits
17	DI	wind dir. indic.	0⩽ 5	1	-1	1⩽ 6	3
18	D	wind direction	1⩽ 362	1 °	0	same	9
19	WI	wind speed indic.	0⩽ 3	1	-1	1⩽ 4	4
20	W	wind speed	0⩽ 102.2	0.1 m s^{-1}	-1	1⩽ 1023	10
21	VI	vis. indic.	0⩽ 2	1	-1	1⩽ 3	2
22	VB	visibility	90⩽ 99	1	89	1⩽ 10	4
23	PW	present weather	0⩽ 99	1	-1	1⩽ 100	7
24	W1	past weather	0⩽ 9	1	-1	1⩽ 10	4
25	W2	2nd past weather	0⩽ 9	1	-1	1⩽ 10	4
26	P	sea level pressure	870.0⩽ 1074.6	0.1 mb	8699	1⩽ 2047	11
27	TI	temp. indic.	0⩽ 5	1	-1	1⩽ 6	4
28	A	air temp.	-99.9⩽ 99.9	0.1 ° C	-1000	1⩽ 1999	11
29	WB	wet bulb temp.	-99.9⩽ 99.9	0.1 ° C	-1000	1⩽ 1999	11
30	DPT	dew point temp.	-99.9⩽ 99.9	0.1 ° C	-1000	1⩽ 1999	11
31	S	sea surface temp.	-99.9⩽ 99.9	0.1 ° C	-1000	1⩽ 1999	11
32	BI	bucket indic.	0⩽ 2	1	-1	1⩽ 3	4
33	C	total cloud amt.	0⩽ 9	1	-1	1⩽ 10	4
34	NH	lower cloud amt.	0⩽ 9	1	-1	1⩽ 10	4
35	CL	low cloud type	0⩽ 10	1	-1	1⩽ 11	4
36	HI	cloud height indic.	0⩽ 1	1	-1	1⩽ 2	2
37	H	cloud height	0⩽ 10	1	-1	1⩽ 11	4
38	CM	middle cloud type	0⩽ 10	1	-1	1⩽ 11	4
39	CH	high cloud type	0⩽ 10	1	-1	1⩽ 11	4
40	WD	wave direction	0⩽ 38	1	-1	1⩽ 39	6
41	WP	wave period	0⩽ 30	1 s	-1	1⩽ 31	5
42	WH	wave height	0⩽ 49.5	0.5 m	-1	1⩽ 100	7
43	SD	swell direction	0⩽ 38	1	-1	1⩽ 39	6
44	SP	swell period	0⩽ 30	1 s	-1	1⩽ 31	5
45	SH	swell height	0⩽ 49.5	0.5 m	-1	1⩽ 100	7
46	A6	allowance # 6 flag	0⩽ 1	1	-1	1⩽ 2	2
						section total	174

Table FO–3
Control Section

#	Field	Description	True value	Units	Base	Coded	Bits
47	CK	checksum	n/a	n/a	n/a	n/a	14
48	AC	attachment count	1⩽15	1	0	same	4
						section total	18
						total	300

Table FO–4
Irregular Section

#	Field	Description	True value	Units	Base	Coded	Bits
49	AL	attachment length	1⩽ 255	1	0	same	8
50	AID	attachment ID	1 ⩽15	1	0	same	4
51	AD	attachment data	n/a	n/a	n/a	n/a	n/a

Compression was achieved by packing data represented as positive integers into fields whose lengths are specified in the bits column of Tables FO–1 through FO–4 . To accomplish this, a field's floating point true value (within the range of that column) was divided by the appropriate units (the smallest increment of the data that has been encoded). After rounding, the base was subtracted to produce a coded positive integer (within the range of that column), which was finally right–justified with zero fill in the field's appropriate position within the report. Using the sea surface temperature (field 31) true value 28.6° C as an example, (28.6/0–1) – (–1000) 1286.

Once a given field has been extracted into a coded value, the true value can be reconstructed by reversing the process:

*true value = (coded+ base) * units*

The above true value example is reconstructed by (1286 + (–1000) * 0.1) – 28.6°C. NOTE: In each coded value, zero is reserved as an indicator of missing data. Of course, none of BOX10, YEAR, MONTH, X, or Y should ever be missing, although DAY and HOUR may be missing.

Explanations for each field in Tables FO–1 through FO–4 are given under the corresponding headings that follow here all information refers to the true value (unless explicit mention is made to the contrary). This supplement is largely self–contained, although some reference is made to TD–11 documentation [5], [6], [7] for fields outside the regular section. *More information about some of the fields, particularly those not in TD–11 or related to duplication elimination, will be found in supps. I , J , or K . The various indicators show the reliability or precision of the data they refer to, and may be extant only if the data are also non-missing (possibly in the erroneous attachment). Algorithms are expressed in FORTRAN.

* Notice is hereby given that some code descriptions, such as those for present weather, are quoted or paraphrased from [5] or [12] without any further indication or credit.

1. Location Section

0) RPTIN

These bits are reserved for use of the RPTIN unblocking utility, where available (e.g., NCAR). Otherwise they may be ignored.

1) BOX10 10° box

See supp. C for a description of the 10 system, and supp. H for related software.

2) YEAR

The year can range from 1800 to 2054.

3) MONTH

1 = January, 2 = February,..., 12 = December.

4) DAY

Day of the month.

5) HOUR

00 to 23 GMT.

6) X longitude

7) Y latitude

Position in tenths of a degree +N, –S, +E.

8) XYI lat/lon indicator
XYI shows the precision to which X and Y were originally keyed, or if they are estimates derived later by interpolation between known positions (XYI = 3 is defined but as yet unused):

0 = degrees and tenths

1 = whole degrees
2 = non-random tenths
3 = interpolated

See supp. K for details on how XYI was set. XYI = 2 (non-random tenths) indicates that the tenths positions appear to be from a deck that has a mixture of degrees and tenths (random) and whole degrees (a constant value such as 0 or 5).

9) CD card deck
Number of the source card deck the report came from, as assigned by NCDC. Each CD used is given with an approximate output period of record in Table F1-1 .

Table F1-1
Card Deck Assignments (GTS*)

CD	Description	Approximate** output period
110	U.S. Navy Marine	1945-1951
116	U.S. Merchant Marine	1945-1963
117	U.S. Navy Hourlies	1952-1964
118	Japanese Ships No. 1	1930-1953
119	Japanese Ships No. 2	1934-1971
128	International Marine (U.S. recruited ships punched in-house)	1900-1978
143	PMEL (Pacific Marine Environmental Laboratory) Buoy	1975-1977
150	Pacific (U.S. Responsibility) HSST Netherlands Receipts	1939-1961
151	Pacific (U.S. Responsibility) HSST German Receipts	1862-1960
152	Pacific (U.S. Responsibility) HSST U.K. Receipts	1854-1961
155	Indian (Netherlands Responsibility) HSST	1861-1960
156	Atlantic (German Responsibility) HSST	1852-1961
184	Great Britain Marine (194 Extension)	1953-1961
185	USSR Marine IGY	1957-1958
186	USSR Ice Stations	1937-1970
187	Japanese Whaling Fleet	1946-1956
188	Norwegian Antarctic Whaling Factory Ships	1932-1939
189	Netherlands Marine	1901-1959
192	Deutsche Seewarte Marine	1855-1939
193	Netherlands Marine	1800-1938
194	Great Britain Marine	1856-1955
195	U.S. Navy Ships Logs	1941-1946
196	Deutsche Seewarte Marine (192 extension)	1949-1954
197	Danish Marine	1871-1956
281	U.S. Navy MAR (Monthly Aerological Record)	1926-1945
555*	Monterey Telecom.	1966-1973
666*	Tuna Boats	1971-1975
849*	FGGE (First GARP Global Experiment)	1978-1979
850*	German FGGE	1978-1979
876-882	NDBC (NOAA Data Buoy Center)	1972-1979
888*	GWC (U.S. Air Force Global Weather Central)	1973-1979
889*	AUTODIN (Dept. of Defense Automatic Digital Network)	1972-1979
891	NODC (National Oceanographic Data Center) Surface	1900-1977
897	*Eltanin*	1962-1963
898	Japanese	1954-1974
899	South African Whaling	1900-1955
900	Australian	1931-1979
901	FOSDIC Reconstructions (card images from 16mm film)	1868-1963
902	Great Britain Marine (184 extension)	1957-1961
926	IMMPC (International Maritime Meteorological Punch Card)	1956-1979
927	International Marine (U.S. recruited ships punched in-house)	1970-1979
928	Same as 927 including OSV (Ocean Station Vessels)	1970-1974
999*	U.S. Air Force ETAC (Environmental Technical Applications Center)	1967-1969

* GTS deck (from the Global Telecommunication System); all others are manuscript data. Decks 849-850 are considered GTS although they may have been mixed.
** Period of record is exact for CMR (supp. D), except that the starting years of decks 156 and 193 are exact for LMR (both start in 1854 in CMR).

10) SID source ID

Each SID may contain a single deck or a mixture of decks; each source ID assigned to date is listed in Table F1–2 together with the format (see supp. I) and character set it was translated from, and the output period of record. (SID 0 is unused and SID 22 was assigned but never translated.)

Table F1–2
Source ID Assignments

SID	CD	Description	Format	Char	Output period
1	mix	Atlas	TD–1100	ebcdic	1800–1969
2	150–2,192	HSST Pacific	TD–1100	ebcdic	1854–1961
3	155	HSST Indian	Exchange	ebcdic	1861–1960
4	156	HSST Atlantic	Exchange	ascii	1852–1961
5	mix	Old TDF–11 Supplement B	TD–1100	ebcdic	1854–1975
6	primarily 128	Old TDF–11 Supplement C	TD–1100	ebcdic	1955–1978
7	555	Monterey Telecom.	TD–1100	ebcdic	1966–1969
8	mix	OSV (Ocean Station Vessels)	TD–1100	ebcdic	1945–1973
9	mix	OSV Supplement	TD–1100	ebcdic	1947–1973
10	mix	MSQ 486 and 105 Omissions	TD–1100	ebcdic	1854–1939
11	891	NODC Surface	TD–1100	ebcdic	1900–1975
12	891	NODC Surface Supplement	TD–1100	ebcdic	1902–1977
13	897	Eltanin	TD–1129M	ebcdic	1962–1963
14	898	Japanese	TD–1129	ebcdic	1954–1974
15	899	South African Whaling	TD–1129M	ebcdic	1900–1955
16	900	Australian	TD–1129	ebcdic	1931–1970
17	926	IMMPC	TD–1129	ebcdic	1956–1963
18	mix	’70s Decade	TD–1129	ascii	1970–1979
19	926	IMMPC (’70s)	TD–1129	ebcdic	1970–1979
20	mix	OSV Z (’70s)	TD–1100	ebcdic	1971–1974
21	900	Australian (’70s)	TD–1129	ebcdic	1971–1979
22	?	Islas Orcadas(’70s)	n/a	n/a	n/a
23	mix	’70s Mislocated Data	TD–1127	ebcdic	1970–1979
24	143,876–82	Buoy Data	TD–1129	ebcdic	1972–1979

11) ST ship type

The type of observing vessel was obtained according to supp. I , and the unreliability of this field is discussed in COADS Release 1.

0 = U.S. Navy or ”deck” log, or unknown
1 = merchant ship or foreign military
2 = ocean station vessel off station or station proximity unknown
3 = ocean station vessel on station
4 = lightship
5 = buoy
6 = research ship

7 = expendable or mechanical bathythermograph (XBT or MBT)

12) QI quality indicator

An overall quality measure as yet undefined and maybe reserved for subsequent analysis.

13) DS dup status
Indicates duplicate status to allow for retention of unclear duplicates (see supp. K).

0 = unique
1 = best duplicate
2 = best duplicate with substitution
3 = worse duplicate, uncertain with hour cross
4 = worse duplicate, uncertain with no cross
5 = worse duplicate, uncertain with day cross

14) DC dup check
The presence of a GTS (Global Telecommunication System) and logbook duplicate provides some location verification, with greater credibility if sea level pressure P and sea surface temperature S match under allowances (see supp. K).

0 = GTS and logbook match with P and S match
1 = GTS and logbook match without P and S match
2 = not GTS and logbook match

15) TC track check

TC is currently unused, but reserved to indicate if a report was:

0 = not track checked
1 = track checked

16) PB pressure bias

PB is currently unused, but reserved to indicate the need for an adjustment because of pressure bias on a specific vessel:

0 = pressure bias adjustment unneeded
1 = pressure bias adjustment has been made
2 = pressure bias adjustment needed

2. Regular Section

17) DI wind direction indicator

DI shows the compass (and approximate precision) used for reporting the wind direction:

0 = 36–point compass
1 = 32–point compass
2 = 16 of 36–point compass
3 = 16 of 32–point compass
4 = 8–point compass
5 = 360–point compass

18) D wind direction

The wind direction is stored in whole degrees (i.e., 360 point compass), or with special codes:

361 = calm
362 = variable

For data converted from TD–11, a translation from the code value to D in whole degrees was made according to Table F2–1 (blank indicated an undefined conversion). All other data (Exchange format) were already recorded in whole degrees, so no translation was made. Consequently, for a given compass, only decks 155 and 156 (or source IDs 3 and 4) may have wind directions different than those shown in Table F2–1 , since no checks for conformity were made.

Table F2-1
Translation of Wind Direction Code into Degrees

Code	DI 0	1	2	3	4
01	10	11			?
02	20	23	25	23	?
03	30	34			?
04	40	45		45	?
05	50	56	45		?
06	60	68		68	?
07	70	79	65		?
08	80	90		90	?
09	90	101	90		
10	100	113		113	
11	110	124	115		
12	120	135		135	
13	130	146			
14	140	158	135	158	
15	150	169			
16	160	180	155	180	
17	170	191			
18	180	203	180	203	
19	190	214			
20	200	225	205	225	
21	210	236			
22	220	248		248	
23	230	259	225		
24	240	270		270	
25	250	281	245		
26	260	293		293	
27	270	304	270		
28	280	315		315	
29	290	326	295		
30	300	338		338	
31	310	349			
32	320	360	315	360	
33	330				
34	340		335		
35	350				
36	360		360		
00(calm)	361	361	361	361	
99(var)	362	362	362	362	

The rationale for the degree values shown in Table F2–1 is as follows. DI=2 winds were translated to degrees based on the way the original 36–point values were translated to 16–point when the data were punched at NCDC. This translation was necessary since the punching equipment was designed specifically for entering 16–point winds. The 36 points were punched as the nearest point on the 16–point compass. Averaging the points included in each 16–point group results in direction values as shown. For example, 20 and 30 degrees were included as the first point (code 02) so 25 degrees is used as the best estimate of the direction in degrees. Seventy, 90, and 100 were punched as the fourth point (code 09) and 90 is used. DI = 3 winds were translated as a simple 16 point compass, since it is not clear how the 32 point winds were translated to 16 point. DI = 4 winds were indicated only in the Exchange format and had already been translated into unknown degrees, hence the question marks.

19) WI wind speed indicator

20) Wind speed

Wind speed is stored in tenths of a meter per second. WI shows the units from which W was converted and the method by which it was originally recorded:

0 = meter per second, estimated (or unknown)
1 = meter per second, measured
2 = knot, estimated (or unknown)
3 = knot, measured

NOTE: no indication is given as to the precision from which W was converted, e.g., A–hole knots.

21) VI visibility indicator

22) XB visibility

VI shows whether VB was:

0 = estimated (or unknown method of observation)
1 = measured
2 = fog present (rarely–used code that is now obsolete, with special meaning in conjunction with XB = 93)

Codes 90 to 99 for kB correspond to horizontal visibility at the surface in kilometers:

90 = < 0.05 kilometers

91 = 0.05
92 = 0.2
93 = 0.5
94 = 1
95 = 2
96 = 4
97 = 10
98 = 20
99 = 50 or more

NOTE: When VI = 2, and VB 93, it means that fog was present and visibility was not reported.

23) PW present weather

Codes 00 to 99 (leading zeros are strictly notational, e.g., for use weather). Codes 00 to 49 indicate no precipitation at the station (e.g., ship) at time of observation.

00 = cloud development not observed.
01 = clouds generally dissolving or becoming less developed.
02 = state of the sky unchanged.
03 = clouds generally forming or developing.
04 = visibility reduced by smoke.
05 = haze.
06 = widespread dust in suspension in the air, not raised by wind at or near the station at time of observation.
07 = dust or sand raised by wind at or near the station at time of observation, but no well-developed dust whirls or sand whirls and no dust storm or sandstorm seen.
08 = well developed dust whirls or sand whirls seen at or near the station during the preceding hour or at time of observation, but no dust storm or sandstorm.
09 = dust storm or sandstorm within sight at time of observation, or at the station during the preceding hour.
10 = light fog (visibility 1,100 yards or more): synonymous with European term "mist."
11 = patches of shallow fog or ice fog at the station, not deeper than about 10 meters.
12 = more or less continuous shallow fog or ice fog at the station, not deeper than about 10 meters.
13 = lightning visible. no thunder heard.
14 = precipitation within sight, not reaching the surface of the sea.
15 = precipitation within sight, reaching the surface of the sea, but more than 5 kilometers from the station.
16 = precipitation within sight, reaching the surface of the sea, near to, but not at the station.

17 = thunderstorm. but no precipitation at time of observation.
18 = squalls at or within sight of the station during the preceding hour or at time of observation.
19 = funnel cloud or waterspout at or within sight of the station during the preceding hour or at time of observation.

Codes 20 to 29 refer to phenomena that occurred at the station during the preceding hour but not at time of observation.

20 = drizzle (not freezing) or snow grains.
21 = rain (not freezing).
22 = snow.
23 = rain and snow or ice pellets, type (a).
24 = freezing drizzle or freezing rain.

25 = shower of rain.
26 = shower of snow, or of rain and snow.
27 = shower of hail (ice pellets, type (b), snow pellets), or of rain and bail.
28 = fog or ice fog.
29 = thunderstorm (with or without precipitation).

Codes 30 to 99 refer to phenomena occurring at the ship at time of observation.

30 = slight or moderate dust storm or sandstorm has decreased during the preceding hour.
31 = slight or moderate dust storm or sandstorm with no appreciable change during the preceding hour.
32 = slight or moderate dust storm or sandstorm has begun or has increased during the preceding hour.
33 = severe dust storm or sandstorm has decreased during the preceding hour.
34 = Severe dust storm or sandstorm with no appreciable change during the preceding hour.
35 = severe dust storm or sandstorm has begun or has increased during the preceding hour.
36 = slight or moderate drifting snow generally low (below eye level, less than 6 feet).
37 = heavy drifting snow generally low (below eye level, less than 6 feet).
38 = slight or moderate blowing snow generally high (above eye level, 6 feet or more).
39 = heavy blowing snow generally high (above eye level, 6 feet or more).
40 = fog or ice fog at a distance at time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer.

41 = fog or ice fog in patches.
42 = fog or ice fog (sky visible) has become thinner during the preceding hour.
43 = fog or ice fog (sky invisible) has become thinner during the preceding hour.
44 = fog or ice fog (sky visible) with no appreciable change during the preceding hour.
45 = fog or ice fog (sky invisible) with no appreciable change during the preceding hour.
46 = fog or ice fog (sky visible) has begun or has become thicker during the preceding hour.
47 = fog or ice fog (sky invisible) has begun or has become thicker during the preceding hour.
48 = fog, depositing rime, sky visible.
49 = fog, depositing rime, sky invisible.

Codes 50 to 99 indicate precipitation at the station at time of observation.

50 = drizzle, not freezing, intermittent, slight at time of observation.
51 = drizzle, not freezing, continuous, slight at time of observation.
52 = drizzle, not freezing, intermittent, moderate at time of observation.
53 = drizzle, not freezing, continuous, moderate at time of observation.
54 = drizzle, not freezing, intermittent, heavy (dense) at time of observation.
55 = drizzle, not freezing, continuous, heavy (dense) at time of observation.
56 = drizzle, freezing, slight.
57 = drizzle, freezing, moderate or heavy (dense).
58 = drizzle and rain, slight.
59 = drizzle and rain, moderate or heavy.
60 = rain, not freezing, intermittent, slight at time of observation.
61 = rain, not freezing, continuous, slight at time of observation.
62 = rain, not freezing, intermittent, moderate at time of observation.
63 = rain, not freezing, continuous, moderate at time of observation.
64 = rain, not freezing, intermittent, heavy at time of observation.
65 = rain, not freezing, continuous, heavy at time of observation.
66 = rain, freezing, slight.

67 = rain, freezing, moderate or heavy.
68 = rain or drizzle and snow, slight.
69 = rain or drizzle and snow, moderate or heavy.
70 = intermittent fall of snowflakes, slight at time of observation.
71 = continuous fall of snowflakes, slight at time of observation.
72 = intermittent fall of snowflakes, moderate at time of observation.
73 = continuous fall of snowflakes, moderate at time of observation.
74 = intermittent fall of snowflakes, heavy at time of observation.
75 = continuous fall of snowflakes, heavy at time of observation.
76 = ice prisms (with or without fog).
77 = snow grains (with or without fog).
78 = isolated star–like snow crystals (with or without fog).
79 = ice pellets, type (a) (sleet, U.S. definition).
80 = rain shower, slight.
81 = rain shower, moderate or heavy.
82 = rain shower, violent.
83 = shower of rain and snow mixed, slight.
84 = shower of rain and snow mixed, moderate or heavy.
85 = snow shower, slight.
86 = snow shower, moderate or heavy.
87 = slight showers of snow pellets or ice pellets, type (b), with or without rain or rain and snow mixed.
88 = moderate or heavy showers of snow pellets or ice pellets, type (b), with or without rain or rain and snow mixed.
89 = slight showers of hail, with or without rain or rain and snow mixed, not associated with thunder.
90 = moderate or heavy showers of hail, with or without rain or rain and snow, mixed, not associated with thunder.
91 = slight rain at time of observation, thunderstorm during preceding hour but not at time of observation.
92 = moderate or heavy rain at time of observation, thunderstorm during preceding hour but not at time of observation.
93 = slight snow, or rain and snow mixed, or hail, at time of observation with thunderstorm during the preceding hour but not at time of observation.
94 = moderate or heavy snow, or rain and snow mixed, or hail, at time of observation with thunderstorm during the preceding hour but not at time of observation.
95 = thunderstorm, slight or moderate, without hail, but with rain and/or snow at time of observation.

96 = thunderstorm, slight or moderate, with hail at time of observation.
97 = thunderstorm, heavy, without hail but with rain and/or snow at time of observation.
98 = thunderstorm combined with dust storm or sandstorm at time of observation.
99 = thunderstorm, heavy, with hail at time of observation.

24) W1 past weather

25) W2 second past weather

Codes 0 to 9 have the same meaning for W1 and W2, which more or less corresponds to that implied by the leading (tens) digit of present weather. The period covered by W1 and W2 is 6 hours for observations at 0000, 0600, 1200, and 1800 GMT, and 3 hours for observations at 0300, 0900, 1500, and 2100 GMT. W1 and W2 are intended to contain the higher and lower, respectively, of two codes that describe as fully as possible the weather during the appropriate period, or both W1 and W2 may contain the same code. W2 became effective only starting on 1 January 1982, so it should always be missing before that date.

0 = cloud covering one-half or less of the sky throughout the appropriate period.
1 = cloud covering more than one-half of the sky during part of the appropriate period and covering one-half or less during part of the period.
2 = cloud covering more than one-half of the sky throughout the appropriate period.
3 = sandstorm, dust storm, or blowing snow.
4 = fog, ice fog, or thick haze (U.S. includes thick smoke).
5 = drizzle.
6 = rain.
7 = snow, or rain and snow mixed.
8 = shower.
9 = thunderstorm with or without precipitation.

26) P sea level pressure
In tenths of a millibar.

27) TI temperature indicator
28) A air temperature
29) WB wet bulb temperature
30) DPT dew point temperature
31) S sea surface temperature

Temperatures are stored in tenths of a degree Celsius. TI shows the precision and units that A, WB, DPT, and S were recorded in or translated to (see supp. I):

0 = degrees Celsius and tenths
1 = whole degrees Celsius
2 = half degrees Celsius
3 = degrees Fahrenheit and tenths
4 = whole degrees Fahrenheit
5 = half degrees Fahrenheit

32) B1 bucket indicator
Shows the method by which S was taken:
0 = unknown
1 = bucket
2 = implied bucket (an HSST SID or any match thereof)

NOTE: B1 values 0 and 1 are unreliable at least for U.S. recruited ships (i.e., country code OK or 02) until starting on 1 May 1973, or perhaps earlier (see COADS Release 1, and for country codes see 161).

33) C total cloud amount

34) NH lower cloud amount

For C, codes 0 to 9 show the fraction of the celestial dome covered by all clouds. For NH they show the fraction of the celestial dome covered by all the low (CL) clouds and, if no CL cloud is present, the fraction covered by all the middle (CM) clouds present:
0 = clear.
1 = 1 okta or less, but not zero.
2–6= 2–6 oktas.
7 = 7 oktas or more, but not 8 oktas.
8 = 8 oktas.
9 = sky obscured or cloud amount cannot be estimated.

35) CL low cloud type

Codes 0 to 10 show characteristics observed of clouds of the types stratocumulus, stratus, cumulus, cumulonimbus, and their variations:
0 = no stratocumulus, stratus, cumulus, or cumulonimbus.
1 = cumulus with little vertical extent and seemingly flattened, or ragged cumulus other than of bad weather, or both.
2 = cumulus of moderate or strong vertical extent, generally with protuberances in the form of domes or towers, either accompanied or not by other cumulus or by stratocumulus, all having their base at the same level.
3 = cumulonimbus the summits of which, at least partially, lack sharp outlines but are neither clearly – fibrous (cirriform) nor in the form of an anvil; cumulus, stratocumulus, or stratus may also be present.

4 = stratocumulus formed by the spreading out of cumulus; cumulus may also be present.
5 = stratocumulus not resulting from the spreading out of cumulus.
6 = stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no stratus fractus of bad weather.
7 = stratus fractus of bad weather (generally existing during precipitation and a short time before and after) or cumulus fractus of bad weather, or both (pannus), usually below altostratus or nimbostratus.
8 = cumulus and stratocumulus other than that formed from the spreading out of cumulus; the base of the cumulus is at a different level from that of the stratocumulus.
9 = cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil; either accompanied or not by cumulonimbus without anvil or fibrous upper part, by cumulus, stratocumulus, stratus, or pannus.
10 = low clouds not visible, owing to darkness, fog, blowing dust or sand, or other similar phenomena.

36) HI cloud height indicator
Shows if the cloud height H was:
0 = estimated
1 = measured

37) H cloud height

Codes 0 to 10. Codes 0 to 9 show the height above sea surface of the base of the lowest cloud or fragment thereof as given by Table F2–2 .

Table F2-2
Cloud Height Codes

Code	Approximate height	
	Feet	Meters
0	0-149	0-49
1	150-299	50-99
2	300-599	100-199
3	600-999	200-299
4	1000-1999	300-599
5	2000-3499	600-999
6	3500-4999	1000-1499
7	5000-6499	1500-1999
8	6500-7999	2000-2499
9	⩾8000 or	⩾2500 or
	no clouds	no clouds

Code 10 indicates H cannot be estimated because of darkness or for other reasons.

38) CM middle cloud type

Codes 0 to 10 show characteristics observed of clouds of the types altocumulus, altostratus, and nimbostratus:

0 = no altocumulus, altostratus, or nimbostratus.
1 = altostratus, the greater part of which is semi-transparent; through this part the sun or moon may be weakly visible, as through ground glass.
2 = altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or nimbostratus.
3 = altocumulus, the greater part of which is semi-transparent; the various elements of the cloud change only slowly and are all at a single level.
4 = patches (often in the form of almonds or fishes) of altocumulus, the greater part of which is semi-transparent; the clouds occur at one or more levels and the elements are continually changing in appearance.
5 = semi-transparent altocumulus in bands, or altocumulus in one or more fairly continuous layers (semi-transparent or opaque), progressively invading the sky; these altocumulus clouds generally thicken as a whole.
6 = altocumulus resulting from the spreading out of cumulus (or cumulonimbus).

7 = altocumulus in two or more layers, usually opaque in places, and not progressively invading the sky; or opaque layer of altocumulus, not progressively invading the sky: or altocumulus together with altostratus or nimbostratus.
8 = altocumulus with sproutings in the form of small towers or battlements; or altocumulus having the appearance of cumuliform tufts.
9 = altocumulus of a chaotic sky, generally at several levels.
10 = middle clouds not visible, owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds.

39) CH high cloud type

Codes 0 to 10 show characteristics observed of clouds of the types cirrus, cirrocumulus and cirrostratus:

0 = no cirrus, cirrocumulus or cirrostratus.
1 = cirrus in the form of filaments, strands, or hooks, not progressively invading the sky
2 = dense cirrus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a cumulonimbus, or cirrus with sproutings in the form of small turrets or battlements, or cirrus having the appearance of cumuliform tufts.
3 = dense cirrus. often in the form of an anvil, being the remains of the upper parts of cumulonimbus.
4 = cirrus in the form of hooks or of filaments, or both, progressively invading the sky; then, generally become denser as a whole.
5 = cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky and generally growing denser as a whole, but the continuous veil does not reach 45 degrees above the horizon.
6 = cirrus (often in bands converging towards one point or two opposite points of the horizon) and cirrostratus, or cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole; the continuous veil extends more than 45 degrees above the horizon, without the sky being totally covered.
7 = veil of cirrostratus covering the celestial dome.
8 = cirrostratus not progressively invading the sky and not completely covering the celestial dome.
9 = cirrocumulus alone, or cirrocumulus accompanied by cirrus or cirrostratus, or both, but cirrocumulus is predominant.

10 = high clouds not visible, owing to darkness, fog, blowing dust or sand, or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds.

40) WD wave direction
Codes 0 to 38. Codes 0 to 36 show the direction from which (wind) waves come, in tens of degrees:

0 =	calm	19 =	185–194°
1 =	005–014°	20 =	195–204°
2 =	015–024°	21 =	205–214°
3 =	025–034°	22 =	215–224°
4 =	035–044°	23 =	225–234°
5 =	045–054°	24 =	235–244°
6 =	055–064°	25 =	245–254°
7 =	065–074°	26 =	255–264°
8 =	075–084°	27 =	265–274°
9 =	085–094°	28 =	275–284°
10 =	095–104°	29 =	285–294°
11 =	105–114°	30 =	295–304°
12 =	115–124°	31 =	305–314°
13 =	125–134°	32 =	315–324°
14 =	135–144°	33 =	325–334°
15 =	145–154°	34 =	335–344°
16 =	155–164°	35 =	345–354°
17 =	165–174°	36 =	355–004°
18 =	175–184°		

Codes 37 and 38 show:

37 = waves confused, direction indeterminate (wave height $\leq$ 4.75 meters).
38 = waves confused, direction indeterminate (wave height $>$ 4.75 meters).

NOTE: In their conversion of data into TD–11, NCDC usually substituted wind direction into missing WD since 1 January 1968, when WD was no longer ordinarily reported. Instead of continuing this practice, modifications were made to properly QC the wave fields without actually substituting wind direction (see supp. J), thereby preserving any remaining information regarding whether WD was separately reported.

41) WP wave period
The old codes for periods WP and SP (swell period) have been converted to whole seconds as given by Tables F2–3 or F2–4 , choosing the higher of 2–second class intervals where applicable. (Periods in whole seconds

were taken in preference to the old codes if both were available, e.g., from TD–1127 or TD–1129.)

Table F2–3
Conversion for WP Always, and for SP Prior to 1968

Seconds	Code	Interval
5	2	5 seconds or less
7	3	6–7 seconds
9	4	8–9 seconds
11	5	10–11 seconds
13	6	12–13 seconds
15	7	14–15 seconds
17	8	16–17 seconds
19	9	18–19 seconds
21	0	20–21 seconds
22	1	over 21 seconds
0	–	calm or period not determined

Table F2–4
Conversion for SP Beginning 1 January 1968

Seconds	Code	Interval
10	0	10 seconds
11	1	11 seconds
12	2	12 seconds
13	3	13 seconds
14	4	14 seconds or more
5	5	5 seconds or less
6	6	6 seconds
7	7	7 seconds
8	8	8 seconds
9	9	9 seconds
0	–	calm or period not determined

42) WH wave height
Codes 0 to 99 show the height in 0.5 meter increments:

0 = less than 0.25 meters
1 to 99 = 0.5 to 49.5 meters

43) SD swell direction
44) SP swell period
45) SH swell height
As given by the corresponding wave fields WD, WP, and WH.

46) A6 allowance #6 flag

Both reports matched under dupelim allowance #6 (see supp. K) were assigned a value showing the number of hours by which the HSST Indian report lagged the deck 193 report, after which either or both reports may have been output:

0 = six hours, or
1 = seven hours

3. Control Section

47) CK checksum
A checksum was computed and stored with each report as a measure of reliability during storage and transmission. The checksum is computed by

1) Summing coded values of all other fields in the report besides RPTIN and the checksum.
2) Obtaining the modulo (28 – 1) of the sum.

Repeating this calculation for every unpacked report, and then verifying that the checksum so obtained agrees with the coded checksum stored in the report, is strongly encouraged. For example, supposing that the coded values of the preceding fields 1 through 46 (excluding RPTIN) are available in an array FIELD, the checksum CK is computed and verified against the stored checksum CKS in FORTRAN as follows:

```
    INTEGER CK,J,FIELD(46),CKS
    CK = 0
    DO 500 J = 1,46
500 CK = CK + FIELD(J)
    CK = MOD(CK,255)
    IF(CK NE. CKS) THEN
      PRINT*, 'ERROR. CK = ', CK, '.NE. CKS', CKS
      STOP
    ENDIF
```

Note that using modulus 2^8–1 takes into account every bit of CK, versus chopping at the eighth bit using modulus 2^8. In addition the top 6 bits are unused.

48) AC attachment count

Shows that AC attachments, as described in sec. 4, follow.

4. Irregular Section

The combined length of the preceding three sections is 300 bits, which is equivalent in length to 75 4-bit characters. Appended after bit

300 are AC attachments (unless AC is zero) whose purpose is to contain information that does not conveniently fit into the binary section of the format. Currently implemented are attachments 1, 4, and 5:

Attachment 1 = quality control flags generated in the quality control program.

Attachment 4 = supplemental data from the original input format.

Attachment 5 = fields that contain invalid characters or out of range values in the original input format.

Each attachment contains three fields:

49) AL attachment length
AL is the length of the attachment data following AID in 4-bit bytes.

50) AID attachment ID
Numeric identifier of this attachment.
- 1 = quality control flags
- 4 = supplemental data
- 5 = error fields

51) AD attachment data
Attachment data are defined in the following.

Attachment 1. Quality Control Flags

Flag values generated by the NCDC defined QC procedure (see supp. J) were stored in TD-11 as alphabetic characters given in Table F4-1 , together with their coded (or true value) equivalents as stored in LMR.

Table F4-1
QC Flag Meaning

Char	Coded	Weight	Meaning	Reason
R	1	0	correct	--
A	2	1	correctable	legality
B	3	1	correctable	internal consistency
J	4	2	suspect	internal consistency
K	5	2	suspect	time
L	6	2	suspect	extreme (mean $\pm 4.8\sigma$)
M	7	3	erroneous	legality
N	8	3	erroneous	internal consistency
Q	9	3	erroneous	extreme (mean $\pm 5.8\sigma$)
S	10	3	missing	--

One of the possible flag values was assigned to each of the flags given in Table F4-2 .

Table F4–2
QC Flag Order and Possible Values

				Possible flag values (X)									
#	Flag	Coded	Bits	R	A	B	J	K	L	M	N	Q	S
1	ship position	1≤10	4	X						X			
2	wind	1≤10	4	X	X		X			X		X	X
3	visibility	1≤10	4	X						X			X
4	present weather	1≤10	4	X		X	X		X	X			X
5	put weather	1≤10	4	X			X			X			X
6	pressure	1≤10	4	X					X	X		X	X
7	air temp.	1≤10	4	X			X		X	X	X	X	X
8	wet bulb temp.	1≤10	4	X		X			X	X	X	X	X
9	dew point temp.	1≤10	4	X		X			X	X	X	X	X
10	sea surface temp.	1≤10	4	X					X	X		X	X
11	cloud	1≤10	4	X		X	X				X		X
12	wave	1≤10	4	X	X	X	X			X	X	X	X
13	swell	1≤10	4	X		X	X			X	X	X	X
14	pressure tendency	1≤10	4	X				X		X			X
15	quality code	1≤43	8										
	total		64										

The quality code is the sum of the weight of flags 1–14. **NOTE: in each coded value, zero is reserved as an indicator of a missing flag**. Thus the quality code true value is actually:

quality code true value = coded – 1

For the flags, the coded and true values are the same.

Attachment 2.

Not currently implemented.

Attachment 3.

Not currently implemented.

Attachment 4. Supplemental Data

All fields not converted to binary and other designated fields are packed into a character string. For TD–1100, TD–1127, and TD–1129 formats this consists of all characters beginning in position 78, 78, and 79, respectively. For the Exchange format this consists of characters from positions 33–35 and 42–46. Refer to supp. I for more details on these formats.

Since the vast bulk of the data is numeric, or numeric overpunch, a 4/8/12–bit "ship" character set was used that maximizes compression but has close ties to ebcdic. These rules were followed in translation to the ship character set:

a) All numeric characters are translated into values 0–9 (equivalent to the low order 4 bits of ebcdic).

b) Spaces translate to the value 10.

c) A subset of other characters is stored as 8–bit where the first 4 bits contain 12, 13, or 14. (See Table F4–3 .)

d) Characters not appearing in Table F4–3 are represented by a 4–bit flag of 15, followed by the original 8–bit character.

e) More than 2 consecutive spaces are represented by a 4–bit flag of 11, followed by a 4–bit count of the (number minus three) of consecutive spaces that these 8 bits replaced. Thus a count of 0=3 spaces, 1=4 spaces,..., 15=18 spaces. Trailing spaces are simply omitted.

Table F4–3
4/8/12-bit Ship Character Table*

	High-order 4-bit byte				
	Empty	11	12	13	14
0	0	3 sp	(12–0)	(11–0)	
1	1	4 sp	A	J	/
2	2	5 sp	B	K	S
3	3	6 sp	C	L	T
4	4	7 sp	D	M	U
5	5	8 sp	E	N	V
6	6	9 sp	F	O	W
low-order 7	7	10 sp	G	P	X
4-bit byte 8	8	11 sp	H	Q	Y
9	9	12 sp	I	R	Z
10	1 Sp	13 sp	&	–	*
11	8-bit	14 sp	+		
12	8-bit	15 sp			
13	8-bit	16 sp			
14	8-bit	17 sp			
15	12-bit	18 sp			

* Read the value of the first 4-bit byte as low-order. If ”8-bit” is shown, this byte is read instead as high-order and be next 4-bit byte u low-order. If ”12-bit” is shown, the next 8-bit byte is the original input character. A run of a spaces is denoted by n sp. Blank positions in the table will be defined as needed.

Comprehensive Ocean–Atmosphere Data Set; Release 1

Supplement G: Box Maps and Landlocked File

0. Introduction

The 10° and 2° box systems used in most of these data are defined and then illustrated on maps. The Marsden Square system and the approximate 2° landlocked file are also described. Refer to supp. H for a description of software tools available for use with 10° and 2° boxes, plus details on a machine-readable copy of the landlocked file and a program to read it.

1. 10° Boxes and Marsden Squares

The 10° box (BOX10) numbering system starts with the lower-left (SW) corner of BOX10–1 at 80° N, 30° E and proceeds east, spiralling down through each zone of latitude as follows (see also Figure G1–1):

BOX10	1	2	...	36	37	...	648
SW corner lat° (+N, –S)	80	80	...	80	70	...	–90
SW corner lon° (+E)	30	40	...	20	30	...	20

The 30° division was chosen to avoid splitting any ocean; therefore, the BOX10s in a 10° latitude zone across any ocean are sequential. (The transformation k = 36 * (J – 1) + i can be used to convert the indices (i, j) of a matrix spanning longitude and latitude, e.g., the FORTRAN array dimensioned BOX10 (36, 18), into a 10° box number k ranging from 1 through 648 as described above.)

Conventions a) and b) are the same as for Marsden Squares.

a) The convention for inclusion of data that fall on the boundary of a BOX10 is dependent on the quadrant: the two inclusive boundaries are those that form the corner nearest the intersection of the equator and the prime meridian (0° N/0° E).

b) However, when the observation falls along the equator or the great circle through the prime meridian (0° E or 180° E), the choice is made by the observer.

Conventions a’) and b’) are necessary to complete the system.

a’) Data at 90° N or 90° S exactly are assigned by convention to BOX10–1 or –648, respectively, and 1° Marsden Square 99 in both cases.

b’) In the event the observer’s choice is not available, the BOX10 chosen (whether the choice is between two or four BOX10s) is that with the highest number.

The 10° Marsden Square (MSQ) numbering system is described here for reference (see also Figure G1–1). The system starts with the lower–right (SE) corner of square 1 at the equator and proceeds west from O° longitude, spiralling up through each zone of latitude to 288 at 70° N, 10° E. Then following a gap in numbering from 289 through 299, it begins again just below the equator with square 300. and proceeds west from 0° longitude down through each zone of latitude to 623 at 90° S, 10° E. Finally, following yet another gap from 624 through 900, it begins again with squares 901 through 936 numbered westward from 0° longitude at 80° N latitude.

Each 10° Marsden Square can be further subdivided into 100 1° sub–squares, numbered 00 through 99 (1° box is synonymous with this 1° sub–square). After the global latitude and longitude are normalized such that $-90° \leqslant Y_y \leqslant 90°$ N and $-180° \leqslant \times XX_x \leqslant 180°$ E, the sub–square number is yx, i.e., concatenation of the units position of latitude and longitude. Exceptions are at 180° E, where yx must be set to y9, and 90° N or 90° S, where both the 10° and 1° Marsden Square are undefined.

2.2 2° Boxes and Landlocked File

The 2° box (BOX2) numbering system starts with BOX2–1 at the North Pole and proceeds east from the prime meridian down through each zone of latitude to 16202 as given by the following:

BOX2–1 is reserved for data at 90 N exactly; thereafter,

BOX2	2	3	...	181	182	...	16201
SW corner lat ° (+N,–S)	88	88	...	88	86	...	–90
SW corner lon ° (+E)	0	2	...	358	0	...	358

BOX2–16202 is reserved for data at 90° S exactly.

(The transformation $k = 180 * (j - 1) + i + 1$ can be used to convert the indices (i,j) of a matrix spanning longitude and latitude, e.g., the FORTRAN array dimensioned BOX2(180, 90), into a 2° box number k ranging from 2 through 16,201 as described above, exclusive of the two polar boxes.)

The convention for inclusion of data that fall on the boundary of a BOX2 is the same as that for a 10° box. Whether the choice of BOX10 for a report was made by the observer or assigned under convention b’), as discussed in sec. 1, it was given the number of the BOX2 enclosed by that BOX10.

Table G2–1 gives in 18 pages the latitude and longitude at the lower–left (SW) corner of each BOX2. The first nine of these (computer generated) pages cover the Northern Hemisphere working eastward from 0° E, and the last nine pages cover the Southern Hemisphere working eastward from 0° E. Each group of 25 (or in the two polar cases 26) BOX2s is delimited as a BOX10, and the BOX10 and MSQ numbers are given at its top. In addition, approximate land boundaries are marked with hand-drawn lines. The names of major land masses have also been marked.

These land boundaries were drawn using values derived from a modified version of the NCDC landlocked file, called LLN2FI, which is available in machine-readable form (see supp. H). The space following each BOX2 shows the specific value associated with it: a period <.> for land, an asterisk <*> for coastal (i.e., any mixture of land and sea), or a space < > for sea. In general, rivers and lakes are shown as land; thus all land <.> boxes form the group referred to as "landlocked" that was automatically trimmed.

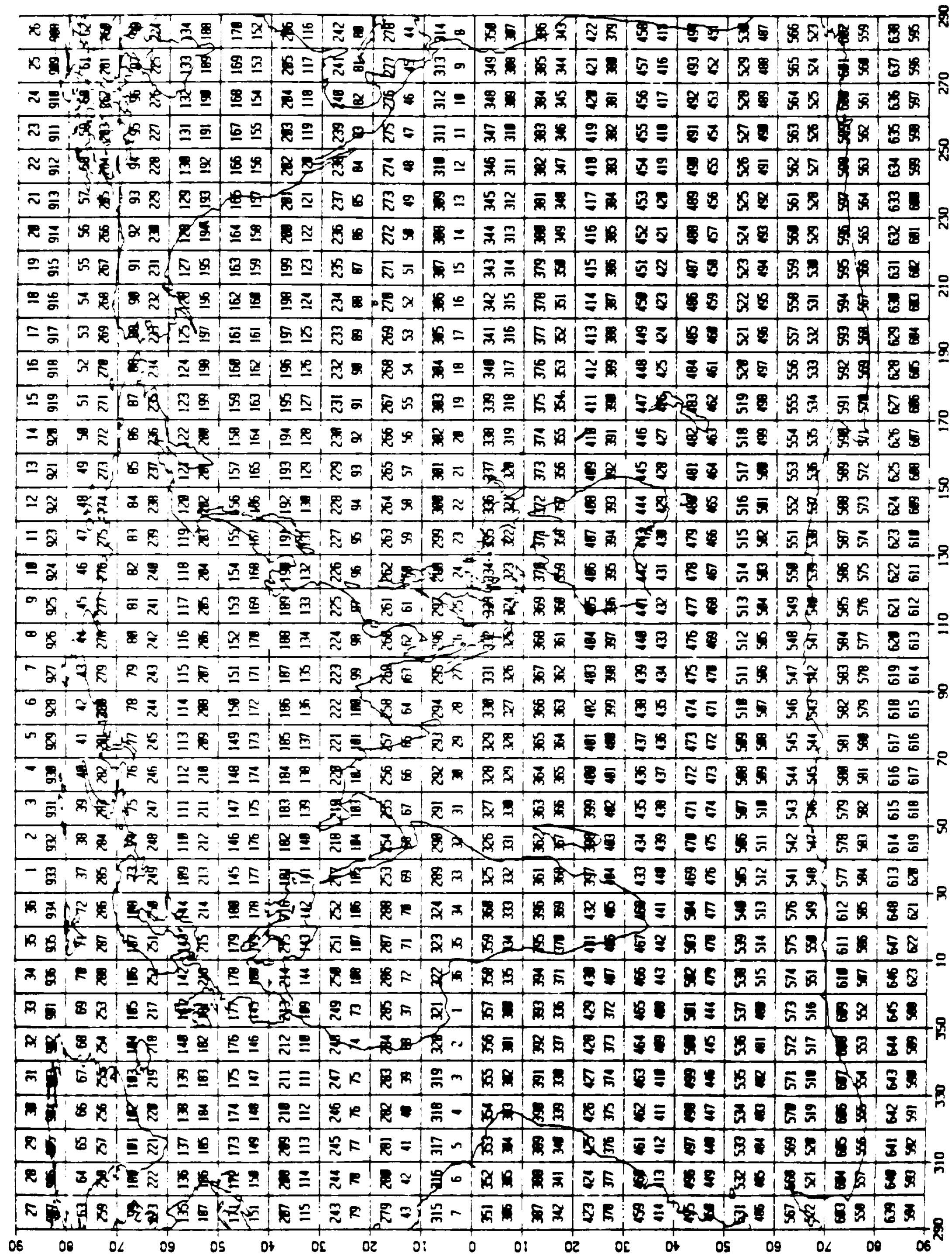

Figure G1-1. 10° boxes (larger numerals) over Marsden Squares (smaller numerals).

Table G2-1

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 1 OF 18

LAT \ LONG->	0	2	4	5	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
90	BOX10/MSQ= 34/936					35/935					36/934					1/933 (N.POLE)=1				
88	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
86	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201
84	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381
82	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561
80	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741
	70/288					71/287					72/286					37/285				
78	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921
76	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101
74	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281
72	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458	1459	1460	1461
70	1622	1623	1624	1625	1626	1627	1628	1629	1630	1631	1632	1633	1634	1635	1636	1637	1638	1639	1640	1641
	106/252					107/251					108/250					73/249				
68	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811*	1812*	1813*	1814.	1815.	1816*	1817*	1818*	1819*	1820	1821
66	1982	1983	1984	1985	1986	1987	1988	1989*	1990*	1991.	1992.	1993.	1994.	1995.	1996.	1997*	1998*	1999*	2000*	2001*
64	2162	2163	2164	2165	2166	2167	2168*	2169.	2170.	2171.	2172*	2173	2174	2175.	2176.	2177.	2178.	2179	2180	2181
62	2342	2343	2344	2345	2346*	2347*	2348.	2349.	2350*	2351	2352	2353*	2354*	2355.	2356.	2357.	2358.	2359.	2360*	2361*
60	2522	2523	2524	2525	2526.	2527.	2528.	2529.	2530*	2531	2532	2533*	2534*	2535*	2536*	2537	2538*	2539.	2540.	2541.
	142/216					143/215					144/214					109/213				
58	2702	2703	2704	2705*	2706*	2707	2708.	2709.	2710*	2711	2712	2713	2714*	2715*	2716*	2717.	2718.	2719.	2720.	2721.
56	2882	2883	2884	2885	2886	2887	2888*	2889*	2890	2891	2892	2893*	2894*	2895.	2896.	2897.	2898.	2899.	2900.	2901.
54	3062	3063	3064	3065	3066	3067	3068	3069	3070	3071	3072	3073.	3074.	3075.	3076.	3077.	3078.	3079.	3080.	3081.
52	3242	3243	3244	3245*	3246*	3247*	3248*	3249*	3250.	3251.	3252.	3253.	3254.	3255.	3256.	3257.	3258.	3259.	3260.	3261.
50	3422	3423*	3424*	3425.	3426.	3427.	3428.	3429.	3430.	3431.	3432.	3433.	3434.	3435.	3436.	3437.	3438.	3439.	3440.	3441.
	178/180					179/179					180/178					145/177				
48	3602*	3603.	3604.	3605.	3606.	3607.	3608.	3609.	3610.	3611.	3612.	3613.	3614.	3615.	3616.	3617.	3618.	3619.	3620.	3621.
46	3782.	3783.	3784.	3785.	3786.	3787.	3788.	3789.	3790.	3791.	3792.	3793.	3794.	3795.	3796.	3797*	3798*	3799*	3800*	3801
44	3962.	3963.	3964.	3965.	3966*	3967*	3968	3969*	3970.	3971.	3972.	3973.	3974.	3975.	3976	3977	3978	3979	3980	3981*
42	4142.	4143*	4144	4145	4146	4147*	4148*	4149	4150	4151*	4152.	4153.	4154.	4155*	4156	4157	4158	4159	4160	4161
40	4322	4323	4324	4325	4326	4327	4328	4329*	4330	4331	4332.	4333*	4334*	4335*	4336	4337*	4338*	4339*	4340*	4341
	214/144					215/143					216/142					181/141				
38	4502	4503	4504	4505	4506	4507	4508	4509	4510	4511	4512	4513	4514	4515*	4516.	4517.	4518.	4519.	4520.	4521.
36	4682	4683	4684	4685	4686	4687	4688	4689	4690	4691	4692	4693	4694	4695	4696*	4697*	4698*	4699*	4700*	4701.
34	4862*	4863.	4864.	4865.	4866.	4867	4868	4869	4870	4871	4872	4873	4874	4875	4876	4877	4878	4879	4880.	4881.
32	5042.	5043.	5044.	5045.	5046.	5047*	5048	5049	5050	5051	5052	5053	5054	5055	5056	5057	5058	5059	5060.	5061.
30	5222.	5223.	5224.	5225.	5226.	5227.	5228.	5229*	5230	5231	5232*	5233.	5234*	5235*	5236	5237*	5238*	5239*	5240.	5241.
	250/108					251/107					252/106					217/105				
28	5402.	5403.	5404.	5405.	5406.	5407.	5408.	5409.	5410.	5411.	5412.	5413.	5414.	5415.	5416.	5417.	5418	5419*	5420.	5421.
26	5582.	5583.	5584.	5585.	5586.	5587.	5588.	5589.	5590.	5591.	5592.	5593.	5594.	5595.	5596.	5597.	5598*	5599	5600*	5601.
24	5762.	5763.	5764.	5765.	5766.	5767.	5768.	5769.	5770.	5771.	5772.	5773.	5774.	5775.	5776.	5777.	5778.	5779	5780	5781*
22	5942.	5943.	5944.	5945.	5946.	5947.	5948.	5949.	5950.	5951.	5952.	5953.	5954.	5955.	5956.	5957.	5958.	5959*	5960	5961*
20	6122.	6123.	6124.	6125.	6126.	6127.	6128.	6129.	6130.	6131.	6132.	6133.	6134.	6135.	6136.	6137.	6138.	6139.	6140*	6141
	286/ 72					287/ 71					288/ 70					253/ 69				
18	6302.	6303.	6304.	6305.	6306.	6307.	6308.	6309.	6310.	6311.	6312.	6313.	6314.	6315.	6316.	6317.	6318.	6319.	6320*	6321
16	6482.	6483.	6484.	6485.	6486.	6487.	6488.	6489.	6490.	6491.	6492.	6493.	6494.	6495.	6496.	6497.	6498.	6499.	6500.	6501*
14	6662.	6663.	6664.	6665.	6666.	6667.	6668.	6669.	6670.	6671.	6672.	6673.	6674.	6675.	6676.	6677.	6678.	6679.	6680.	6681*
12	6842.	6843.	6844.	6845.	6846.	6847.	6848.	6849.	6850.	6851.	6852.	6853.	6854.	6855.	6856.	6857.	6858.	6859.	6860.	6861.
10	7022.	7023.	7024.	7025.	7026.	7027.	7028.	7029.	7030.	7031.	7032.	7033.	7034.	7035.	7036.	7037.	7038.	7039.	7040.	7041.
	322/ 36					323/ 35					324/ 34					289/ 33				
8	7202.	7203.	7204.	7205.	7206.	7207.	7208.	7209.	7210.	7211.	7212.	7213.	7214.	7215.	7216.	7217.	7218.	7219.	7220.	7221.
6	7382*	7383*	7384*	7385.	7386.	7387.	7388.	7389.	7390.	7391.	7392.	7393.	7394.	7395.	7396.	7397.	7398.	7399.	7400.	7401.
4	7562	7563	7564	7565*	7566*	7567.	7568.	7569.	7570.	7571.	7572.	7573.	7574.	7575.	7576.	7577.	7578.	7579.	7580.	7581.
2	7742	7743	7744	7745	7746	7747.	7748.	7749.	7750.	7751.	7752.	7753.	7754.	7755.	7756.	7757.	7758.	7759.	7760.	7761.
0	7922	7923	7924	7925	7926	7927.	7928.	7929.	7930.	7931.	7932.	7933.	7934.	7935.	7936.	7937.	7938.	7939.	7940.	7941.

Margin labels (handwritten): ATLANTIC OCEAN; EUROPE; AFRICA; EUROPE; SAUDI ARABIA; RED SEA; AFRICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2 — FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 2 OF 18

LAT \ LONG->	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
BOX10/MSQ=			2/932					3/931					4/930					5/929		
88	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
86	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
84	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401
82	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581
80	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761
			38/284					39/283					40/282					41/281		
78	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941
76	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121
74	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301
72	1462	1463	1464	1465	1466	1467	1468	1469*	1470	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481
70	1642	1643	1644	1645	1646	1647	1648	1649	1650	1651	1652	1653	1654	1655	1656*	1657*	1658	1659*	1660	1661*
			74/248					75/247					76/246					77/245		
68	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833*	1834*	1835	1836*	1837.	1838	1839	1840*	1841*
66	2002	2003	2004	2005	2006*	2007.	2008*	2009*	2010.	2011.	2012.	2013.	2014.	2015.	2016*	2017*	2018	2019*	2020*	2021*
64	2182*	2183.	2184*	2185.	2186.	2187.	2188.	2189.	2190.	2191.	2192.	2193.	2194.	2195.	2196.	2197.	2198.	2199.	2200.	2201.
62	2362.	2363.	2364.	2365.	2366.	2367.	2368.	2369.	2370.	2371.	2372.	2373.	2374.	2375.	2376.	2377.	2378.	2379.	2380.	2381.
60	2542.	2543.	2544.	2545.	2546.	2547.	2548.	2549.	2550.	2551.	2552.	2553.	2554.	2555.	2556.	2557.	2558.	2559.	2560.	2561.
			110/212					111/211					112/210					113/209		
58	2722.	2723.	2724.	2725.	2726.	2727.	2728.	2729.	2730.	2731.	2732.	2733.	2734.	2735.	2736.	2737.	2738.	2739.	2740.	2741.
56	2902.	2903.	2904.	2905.	2906.	2907.	2908.	2909.	2910.	2911.	2912.	2913.	2914.	2915.	2916.	2917.	2918.	2919.	2920.	2921.
54	3082.	3083.	3084.	3085.	3086.	3087.	3088.	3089.	3090.	3091.	3092.	3093.	3094.	3095.	3096.	3097.	3098.	3099.	3100.	3101.
52	3262.	3263.	3264.	3265.	3266.	3267.	3268.	3269.	3270.	3271.	3272.	3273.	3274.	3275.	3276.	3277.	3278.	3279.	3280.	3281.
50	3442.	3443.	3444.	3445.	3446.	3447.	3448.	3449.	3450.	3451.	3452.	3453.	3454.	3455.	3456.	3457.	3458.	3459.	3460.	3461.
			146/176					147/175					148/174					149/173		
48	3622.	3623.	3624.	3625.	3626.	3627.	3628.	3629.	3630.	3631.	3632.	3633.	3634.	3635.	3636.	3637.	3638.	3639.	3640.	3641.
46	3802.	3803.	3804.	3805*	3806*	3807*	3808*	3809.	3810.	3811.	3812.	3813.	3814.	3815.	3816.	3817.	3818.	3819.	3820.	3821.
44	3982.	3983.	3984.	3985*	3986	3987	3988*	3989*	3990.	3991.	3992.	3993.	3994.	3995.	3996.	3997.	3998.	3999.	4000.	4001.
42	4162*	4163.	4164.	4165*	4166	4167	4168*	4169.	4170.	4171.	4172.	4173.	4174.	4175.	4176.	4177.	4178.	4179.	4180.	4181.
40	4342*	4343.	4344.	4345.	4346*	4347	4348	4349*	4350.	4351.	4352.	4353.	4354.	4355.	4356.	4357.	4358.	4359.	4360.	4361.
			182/140					183/139					184/138					185/137		
38	4522.	4523.	4524.	4525.	4526*	4527	4528	4529.	4530.	4531.	4532.	4533.	4534.	4535.	4536.	4537.	4538.	4539.	4540.	4541.
36	4702.	4703.	4704.	4705.	4706*	4707	4708	4709*	4710.	4711.	4712.	4713.	4714.	4715.	4716.	4717.	4718.	4719.	4720.	4721.
34	4882.	4883.	4884.	4885.	4886.	4887.	4888.	4889.	4890.	4891.	4892.	4893.	4894.	4895.	4896.	4897.	4898.	4899.	4900.	4901.
32	5062.	5063.	5064.	5065.	5066.	5067.	5068.	5069.	5070.	5071.	5072.	5073.	5074.	5075.	5076.	5077.	5078.	5079.	5080.	5081.
30	5242.	5243.	5244.	5245.	5246*	5247*	5248.	5249.	5250.	5251.	5252.	5253.	5254.	5255.	5256.	5257.	5258.	5259.	5260.	5261.
			218/104					219/103					220/102					221/101		
28	5422.	5423.	5424.	5425*	5426	5427*	5428.	5429.	5430.	5431.	5432.	5433.	5434.	5435.	5436.	5437.	5438.	5439.	5440.	5441.
26	5602.	5603.	5604.	5605.	5606*	5607	5608	5609*	5610*	5611.	5612.	5613.	5614.	5615.	5616.	5617.	5618.	5619.	5620.	5621.
24	5782.	5783.	5784.	5785.	5786.	5787	5788	5789	5790	5791	5792	5793	5794	5795*	5796.	5797.	5798.	5799.	5800.	5801.
22	5962.	5963.	5964.	5965.	5966.	5967.	5968*	5969.	5970*	5971*	5972	5973	5974	5975	5976*	5977*	5978*	5979.	5980.	5981.
20	6142*	6143.	6144.	6145.	6146.	6147.	6148.	6149.	6150*	6151	6152	6153	6154	6155	6156	6157	6158*	6159.	6160.	6161.
			254/ 68					255/ 67					256/ 66					257/ 65		
18	6322	6323.	6324.	6325.	6326.	6327.	6328.	6329.	6330*	6331	6332	6333	6334	6335	6336	6337	6338	6339.	6340.	6341.
16	6502	6503*	6504.	6505.	6506.	6507.	6508*	6509*	6510	6511	6512	6513	6514	6515	6516	6517	6518	6519.	6520.	6521.
14	6682	6683*	6684.	6685.	6686*	6687	6688	6689	6690	6691	6692	6693	6694	6695	6696	6697	6698	6699*	6700.	6701.
12	6862*	6863	6864*	6865	6866	6867	6868	6869	6870	6871	6872	6873	6874	6875	6876	6877	6878	6879*	6880.	6881*
10	7042.	7043*	7044	7045	7046*	7047	7048	7049	7050	7051	7052	7053	7054	7055	7056	7057	7058	7059	7060*	7061*
			290/ 32					291/ 31					292/ 30					293/ 29		
8	7222.	7223.	7224.	7225.	7226*	7227	7228	7229	7230	7231	7232	7233	7234	7235	7236	7237	7238	7239	7240*	7241
6	7402.	7403.	7404.	7405.	7406*	7407	7408	7409	7410	7411	7412	7413	7414	7415	7416	7417	7418	7419	7420	7421
4	7582.	7583.	7584.	7585*	7586	7587	7588	7589	7590	7591	7592	7593	7594	7595	7596	7597	7598	7599	7600	7601
2	7762.	7763.	7764*	7765	7766	7767	7768	7769	7770	7771	7772	7773	7774	7775	7776	7777	7778	7779	7780	7781
0	7942.	7943*	7944	7945	7946	7947	7948	7949	7950	7951	7952	7953	7954	7955	7956	7957	7958	7959	7960	7961

EUROPE ARABIA SAUDI RED SEA AFRICA ASIA INDIA INDIAN OCEAN

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 3 OF 18

ASIA

LAT \ LONG->	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118
BOX10/MSQ=			6/928					7/927					8/926					9/925		
88	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
86	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241
84	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421
82	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601
80	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781
			42/280					43/279					44/278					45/277		
78	942	943	944	945	946	947	948	949	950*	951	952	953	954	955	956	957	958	959	960	961
76	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133*	1134	1135	1136	1137	1138	1139	1140	1141
74	1302	1303	1304	1305	1306*	1307*	1308*	1309*	1310*	1311*	1312.	1313.	1314.	1315.	1316*	1317*	1318	1319	1320	1321
72	1482	1483*	1484*	1485*	1486.	1487.	1488.	1489.	1490.	1491.	1492.	1493*	1494*	1495	1496*	1497*	1498*	1499*	1500*	1501*
70	1662*	1663	1664.	1665.	1666.	1667.	1668.	1669.	1670.	1671.	1672.	1673*	1674.	1675.	1676.	1677.	1678.	1679.	1680.	1681.
			78/244					79/243					80/242					81/241		
68	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.
66	2022.	2023.	2024.	2025.	2026.	2027.	2028.	2029.	2030.	2031.	2032.	2033.	2034.	2035.	2036.	2037.	2038.	2039.	2040.	2041.
64	2202.	2203.	2204.	2205.	2206.	2207.	2208.	2209.	2210.	2211.	2212.	2213.	2214.	2215.	2216.	2217.	2218.	2219.	2220.	2221.
62	2382.	2383.	2384.	2385.	2386.	2387.	2388.	2389.	2390.	2391.	2392.	2393.	2394.	2395.	2396.	2397.	2398.	2399.	2400.	2401.
60	2562.	2563.	2564.	2565.	2566.	2567.	2568.	2569.	2570.	2571.	2572.	2573.	2574.	2575.	2576.	2577.	2578.	2579.	2580.	2581.
			114/208					115/207					116/205					117/205		
58	2742.	2743.	2744.	2745.	2746.	2747.	2748.	2749.	2750.	2751.	2752.	2753.	2754.	2755.	2756.	2757.	2758.	2759.	2760.	2761.
56	2922.	2923.	2924.	2925.	2926.	2927.	2928.	2929.	2930.	2931.	2932.	2933.	2934.	2935.	2936.	2937.	2938.	2939.	2940.	2941.
54	3102.	3103.	3104.	3105.	3106.	3107.	3108.	3109.	3110.	3111.	3112.	3113.	3114.	3115.	3116.	3117.	3118.	3119.	3120.	3121.
52	3282.	3283.	3284.	3285.	3286.	3287.	3288.	3289.	3290.	3291.	3292.	3293.	3294.	3295.	3296.	3297.	3298.	3299.	3300.	3301.
50	3462.	3463.	3464.	3465.	3466.	3467.	3468.	3469.	3470.	3471.	3472.	3473.	3474.	3475.	3476.	3477.	3478.	3479.	3480.	3481.
			150/172					151/171					152/170					153/169		
48	3642.	3643.	3644.	3645.	3646.	3647.	3648.	3649.	3650.	3651.	3652.	3653.	3654.	3655.	3656.	3657.	3658.	3659.	3660.	3661.
46	3822.	3823.	3824.	3825.	3826.	3827.	3828.	3829.	3830.	3831.	3832.	3833.	3834.	3835.	3836.	3837.	3838.	3839.	3840.	3841.
44	4002.	4003.	4004.	4005.	4006.	4007.	4008.	4009.	4010.	4011.	4012.	4013.	4014.	4015.	4016.	4017.	4018.	4019.	4020.	4021.
42	4182.	4183.	4184.	4185.	4186.	4187.	4188.	4189.	4190.	4191.	4192.	4193.	4194.	4195.	4196.	4197.	4198.	4199.	4200.	4201.
40	4362.	4363.	4364.	4365.	4366.	4367.	4368.	4369.	4370.	4371.	4372.	4373.	4374.	4375.	4376.	4377.	4378.	4379.	4380.	4381*
			186/136					187/135					188/134					189/133		
38	4542.	4543.	4544.	4545.	4546.	4547.	4548.	4549.	4550.	4551.	4552.	4553.	4554.	4555.	4556.	4557.	4558.	4559.	4560*	4561
36	4722.	4723.	4724.	4725.	4726.	4727.	4728.	4729.	4730.	4731.	4732.	4733.	4734.	4735.	4736.	4737.	4738.	4739.	4740.	4741*
34	4902.	4903.	4904.	4905.	4906.	4907.	4908.	4909.	4910.	4911.	4912.	4913.	4914.	4915.	4916.	4917.	4918.	4919.	4920.	4921*
32	5082.	5083.	5084.	5085.	5086.	5087.	5088.	5089.	5090.	5091.	5092.	5093.	5094.	5095.	5096.	5097.	5098.	5099.	5100.	5101*
30	5262.	5263.	5264.	5265.	5266.	5267.	5268.	5269.	5270.	5271.	5272.	5273.	5274.	5275.	5276.	5277.	5278.	5279.	5280.	5281*
			222/100					223/ 99					224/ 98					225/ 97		
28	5442.	5443.	5444.	5445.	5446.	5447.	5448.	5449.	5450.	5451.	5452.	5453.	5454.	5455.	5456.	5457.	5458.	5459.	5460.	5461.
26	5622.	5623.	5624.	5625.	5626.	5627.	5628.	5629.	5630.	5631.	5632.	5633.	5634.	5635.	5636.	5637.	5638.	5639.	5640.	5641*
24	5802.	5803.	5804.	5805.	5806.	5807.	5808.	5809.	5810.	5811.	5812.	5813.	5814.	5815.	5816.	5817.	5818.	5819.	5820*	5821
22	5982.	5983.	5984.	5985.	5986*	5987*	5988.	5989.	5990.	5991.	5992.	5993.	5994.	5995.	5996.	5997.	5998*	5999*	6000	6001
20	6162.	6163.	6164.	6165	6166	6167	6168*	6169.	6170.	6171.	6172.	6173.	6174.	6175*	6176	6177	6178	6179	6180	6181
			258/ 64					259/ 63					260/ 62					261/ 61		
18	6342.	6343*	6344	6345	6346	6347	6348	6349*	6350.	6351.	6352.	6353.	6354*	6355	6356	6357	6358	6359	6360	6361
16	6522*	6523	6524	6525	6526	6527	6528	6529*	6530	6531.	6532.	6533.	6534.	6535*	6536	6537	6538	6539	6540	6541
14	6702	6703	6704	6705	6706	6707	6708	6709	6710	6711*	6712.	6713.	6714.	6715.	6716	6717	6718	6719	6720	6721
12	6882	6883	6884	6885	6886	6887	6888	6889	6890	6891	6892*	6893*	6894.	6895.	6896*	6897	6898	6899	6900	6901
10	7062	7063	7064	7065	7066	7067	7068	7069	7070	7071	7072	7073	7074*	7075*	7076	7077	7078	7079	7080	7081
			294/ 28					295/ 27					296/ 26					297/ 25		
8	7242	7243	7244	7245	7246	7247	7248	7249	7250	7251	7252	7253	7254	7255	7256	7257	7258	7259	7260	7261
6	7422*	7423	7424	7425	7426	7427	7428	7429	7430	7431	7432	7433	7434	7435	7436	7437	7438	7439	7440	7441
4	7602	7603	7604	7605	7606	7607	7608	7609	7610	7611	7612*	7613*	7614	7615	7616	7617	7618	7619	7620*	7621
2	7782	7783	7784	7785	7786	7787	7788	7789	7790	7791	7792	7793*	7794	7795	7796	7797	7798*	7799.	7800*	7801
0	7962	7963	7964	7965	7966	7967	7968	7969	7970	7971*	7972*	7973	7974	7975	7976	7977*	7978.	7979.	7980*	7981

ASIA

INDIAN OCEAN

BORNEO

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2 FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 4 OF 10

LAT LONG->	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158
BOX10/MSQ*			10/924					11/923					12/922					13/921		
88	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
86	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261
84	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441
82	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621
80	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801
			46/276					47/275					48/274					49/273		
78	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981
76	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161
74	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331*	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341
72	1502	1503	1504	1505	1506	1507	1508	1509	1510	1511	1512	1513	1514	1515	1516	1517	1518	1519	1520	1521
70	1682.	1683.	1684*	1685	1686*	1687	1688*	1689*	1690*	1691*	1692*	1693	1694*	1695*	1696*	1697	1698	1699	1700	1701
			82/240					83/239					84/238					85/237		
68	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881*
66	2042.	2043.	2044.	2045.	2046.	2047.	2048.	2049.	2050.	2051.	2052.	2053.	2054.	2055.	2056*	2057.	2058.	2059.	2060.	2061.
64	2222.	2223.	2224.	2225.	2226.	2227.	2228.	2229.	2230.	2231.	2232.	2233.	2234.	2235.	2236.	2237.	2238.	2239.	2240.	2241.
62	2402.	2403.	2404.	2405.	2406.	2407.	2408.	2409.	2410.	2411.	2412.	2413.	2414.	2415.	2416.	2417.	2418.	2419.	2420.	2421.
60	2582.	2583.	2584.	2585.	2586.	2587.	2588.	2589.	2590.	2591.	2592.	2593.	2594.	2595.	2596.	2597.	2598.	2599*	2600	2601
			118/204					119/203					120/202					121/201		
58	2762.	2763.	2764.	2765.	2766.	2767.	2768.	2769.	2770.	2771.	2772*	2773	2774	2775	2776	2777	2778	2779	2780	2781
56	2942.	2943.	2944.	2945.	2946.	2947.	2948.	2949.	2950*	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960*	2961*
54	3122.	3123.	3124.	3125.	3126.	3127.	3128.	3129*	3130	3131	3132	3133	3134	3135	3136	3137	3138	3139	3140.	3141*
52	3302.	3303.	3304.	3305.	3306.	3307.	3308.	3309.	3310*	3311*	3312	3313*	3314	3315	3316	3317	3318	3319	3320*	3321
50	3482.	3483.	3484.	3485.	3486.	3487.	3488.	3489.	3490.	3491.	3492	3493	3494	3495	3496	3497	3498	3499	3500	3501
			154/168					155/167					156/166					157/165		
48	3662.	3663.	3664.	3665.	3666.	3667.	3668.	3669.	3670.	3671*	3672	3673	3674	3675	3676	3677	3678	3679	3680	3681
46	3842.	3843.	3844.	3845.	3846.	3847.	3848.	3849.	3850*	3851	3852	3853	3854	3855	3856	3857	3858	3859	3860	3861
44	4022.	4023.	4024.	4025.	4026.	4027.	4028.	4029*	4030	4031	4032	4033	4034	4035	4036	4037	4038	4039	4040	4041
42	4202.	4203.	4204.	4205.	4206.	4207*	4208*	4209	4210	4211	4212	4213*	4214	4215	4216	4217	4218	4219	4220	4221
40	4382*	4383*	4384.	4385*	4386*	4387	4388	4389	4390	4391	4392	4393	4394	4395	4396	4397	4398	4399	4400	4401
			190/132					191/131					192/130					193/129		
38	4562	4563	4564	4565*	4566	4567	4568	4569	4570	4571	4572	4573	4574	4575	4576	4577	4578	4579	4580	4581
36	4742	4743	4744	4745*	4746*	4747	4748	4749	4750	4751*	4752	4753	4754	4755	4756	4757	4758	4759	4760	4761
34	4922	4923	4924	4925*	4926	4927	4928	4929	4930*	4931	4932	4933	4934	4935	4936	4937	4938	4939	4940	4941
32	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112	5113	5114	5115	5116	5117	5118	5119	5120	5121
30	5282	5283	5284	5285	5286	5287	5288	5289	5290	5291	5292	5293	5294	5295	5296	5297	5298	5299	5300	5301
			226/ 96					227/ 95					228/ 94					229/ 93		
28	5462*	5463	5464	5465	5466	5467	5468	5469	5470	5471	5472	5473	5474	5475	5476	5477	5478	5479	5480	5481
26	5642	5643	5644	5645	5646	5647	5648	5649	5650	5651	5652	5653	5654	5655	5656	5657	5658	5659	5660	5661
24	5822	5823	5824	5825	5826	5827	5828	5829	5830	5831	5832	5833	5834	5835	5836	5837	5838	5839	5840	5841
22	6002	6003	6004	6005	6006	6007	6008	6009	6010	6011	6012	6013	6014	6015	6016	6017	6018	6019	6020	6021
20	6182	6183	6184	6185	6186	6187	6188	6189	6190	6191	6192	6193	6194	6195	6196	6197	6198	6199	6200	6201
			262/ 60					263/ 59					254/ 58					255/ 57		
18	6362	6363	6364	6365	6366	6367	6368	6369	6370	6371	6372	6373	6374	6375	6376	6377	6378	6379	6380	6381
16	6542*	6543	6544	6545	6546	6547	6548	6549	6550	6551	6552	6553	6554	6555	6556	6557	6558	6559	6560	6561
14	6722	6723	6724	6725	6726	6727	6728	6729	6730	6731	6732	6733	6734	6735	6736	6737	6738	6739	6740	6741
12	6902	6903	6904	6905	6906	6907	6908	6909	6910	6911	6912	6913	6914	6915	6916	6917	6918	6919	6920	6921
10	7082	7083	7084	7085	7086	7087	7088	7089	7090	7091	7092	7093	7094	7095	7096	7097	7098	7099	7100	7101
			298/ 24					299/ 23					300/ 22					301/ 21		
8	7262	7263	7264	7265	7266	7267	7268	7269	7270	7271	7272	7273	7274	7275	7276	7277	7278	7279	7280	7281
6	7442	7443	7444	7445	7446	7447	7448	7449	7450	7451	7452	7453	7454	7455	7456	7457	7458	7459	7460	7461
4	7622	7623	7624	7625	7626	7627	7628	7629	7630	7631	7632	7633	7634	7635	7636	7637	7638	7639	7640	7641
2	7802	7803	7804	7805	7806	7807	7808	7809	7810	7811	7812	7813	7814	7815	7816	7817	7818	7819	7820	7821
0	7982	7983	7984	7985	7986	7987	7988	7989	7990	7991	7992	7993	7994	7995	7996	7997	7998	7999	8000	8001

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 5 OF 18

ALASKA

PACIFIC OCEAN

SOVIET UNION

LAT \ LONG->	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198
BOX10/MSQ=			14/920					15/919					16/918					17/917		
88	82	83	84	85	85	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101
86	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281
84	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461
82	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641
80	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821
			50/272					51/271					52/270					53/269		
78	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001
76	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181
74	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361
72	1522	1523	1524	1525	1526	1527	1528	1529	1530	1531	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
70	1702	1703	1704	1705	1706	1707	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717	1718	1719	1720	1721
			86/236					87/235					88/234					89/233		
68	1882*	1883*	1884*	1885*	1886*	1887*	1888*	1889*	1890*	1891*	1892	1893	1894	1895	1896	1897	1898	1899	1900*	1901.
66	2062.	2063.	2064.	2065.	2066.	2067.	2068.	2069.	2070.	2071.	2072*	2073*	2074*	2075	2076	2077	2078	2079	2080	2081*
64	2242.	2243.	2244.	2245.	2246.	2247.	2248.	2249.	2250*	2251*	2252	2253	2254*	2255*	2256	2257	2258	2259*	2260*	2261*
62	2422.	2423*	2424*	2425.	2426.	2427.	2428.	2429*	2430*	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440*	2441*
60	2602	2603	2604*	2605*	2606*	2607*	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619*	2620*	2621*
			122/200					123/199					124/198					125/197		
58	2782*	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801
56	2962*	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981
54	3142*	3143	3144	3145	3146	3147	3148	3149	3150	3151	3152	3153	3154	3155	3156	3157	3158	3159	3160	3161
52	3322	3323	3324	3325	3326	3327	3328	3329	3330	3331	3332	3333	3334	3335	3336	3337	3338	3339	3340	3341
50	3502	3503	3504	3505	3506	3507	3508	3509	3510	3511	3512	3513	3514	3515	3516	3517	3518	3519	3520	3521
			158/164					159/163					160/162					161/161		
48	3682	3683	3684	3685	3686	3687	3688	3689	3690	3691	3692	3693	3694	3695	3696	3697	3698	3699	3700	3701
46	3862	3863	3864	3865	3866	3867	3868	3869	3870	3871	3872	3873	3874	3875	3876	3877	3878	3879	3880	3881
44	4042	4043	4044	4045	4046	4047	4048	4049	4050	4051	4052	4053	4054	4055	4056	4057	4058	4059	4060	4061
42	4222	4223	4224	4225	4226	4227	4228	4229	4230	4231	4232	4233	4234	4235	4236	4237	4238	4239	4240	4241
40	4402	4403	4404	4405	4406	4407	4408	4409	4410	4411	4412	4413	4414	4415	4416	4417	4418	4419	4420	4421
			194/128					195/127					196/126					197/125		
38	4582	4583	4584	4585	4586	4587	4588	4589	4590	4591	4592	4593	4594	4595	4596	4597	4598	4599	4600	4601
36	4762	4763	4764	4765	4766	4767	4768	4769	4770	4771	4772	4773	4774	4775	4776	4777	4778	4779	4780	4781
34	4942	4943	4944	4945	4946	4947	4948	4949	4950	4951	4952	4953	4954	4955	4956	4957	4958	4959	4960	4961
32	5122	5123	5124	5125	5126	5127	5128	5129	5130	5131	5132	5133	5134	5135	5136	5137	5138	5139	5140	5141
30	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312	5313	5314	5315	5316	5317	5318	5319	5320	5321
			230/92					231/91					232/90					233/89		
28	5482	5483	5484	5485	5486	5487	5488	5489	5490	5491	5492	5493	5494	5495	5496	5497	5498	5499	5500	5501
26	5662	5663	5664	5665	5666	5667	5668	5669	5670	5671	5672	5673	5674	5675	5676	5677	5678	5679	5680	5681
24	5842	5843	5844	5845	5846	5847	5848	5849	5850	5851	5852	5853	5854	5855	5856	5857	5858	5859	5860	5861
22	6022	6023	6024	6025	6026	6027	6028	6029	6030	6031	6032	6033	6034	6035	6036	6037	6038	6039	6040	6041
20	6202	6203	6204	6205	6206	6207	6208	6209	6210	6211	6212	6213	6214	6215	6216	6217	6218	6219	6220	6221
			266/56					267/55					268/54					269/53		
18	6382	6383	6384	6385	6386	6387	6388	6389	6390	6391	6392	6393	6394	6395	6396	6397	6398	6399	6400	6401
16	6562	6563	6564	6565	6566	6567	6568	6569	6570	6571	6572	6573	6574	6575	6576	6577	6578	6579	6580	6581
14	6742	6743	6744	6745	6746	6747	6748	6749	6750	6751	6752	6753	6754	6755	6756	6757	6758	6759	6760	6761
12	6922	6923	6924	6925	6926	6927	6928	6929	6930	6931	6932	6933	6934	6935	6936	6937	6938	6939	6940	6941
10	7102	7103	7104	7105	7106	7107	7108	7109	7110	7111	7112	7113	7114	7115	7116	7117	7118	7119	7120	7121
			302/20					303/19					304/18					305/17		
8	7282	7283	7284	7285	7286	7287	7288	7289	7290	7291	7292	7293	7294	7295	7296	7297	7298	7299	7300	7301
6	7462	7463	7464	7465	7466	7467	7468	7469	7470	7471	7472	7473	7474	7475	7476	7477	7478	7479	7480	7481
4	7642	7643	7644	7645	7646	7647	7648	7649	7650	7651	7652	7653	7654	7655	7656	7657	7658	7659	7660	7661
2	7822	7823	7824	7825	7826	7827	7828	7829	7830	7831	7832	7833	7834	7835	7836	7837	7838	7839	7840	7841
0	8002	8003	8004	8005	8006	8007	8008	8009	8010	8011	8012	8013	8014	8015	8016	8017	8018	8019	8020	8021

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.OIC. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 6 OF 18

LAT LONG->	200	202	204	206	208	210	212	214	216	218	220	222	224	226	228	230	232	234	236	238
BOX10/MSQ=			18/916					19/915					20/914					21/913		
88	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
86	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301
84	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481
82	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661
80	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841
			54/268					55/267					56/266					57/265		
78	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
76	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201
74	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381
72	1542	1543	1544	1545	1546	1547	1548	1549	1550	1551	1552	1553	1554	1555	1556	1557	1558	1559	1560*	1561*
70	1722	1723	1724	1725	1726	1727	1728	1729	1730	1731	1732	1733	1734	1735	1736	1737	1738	1739	1740	1741
			90/232					91/231					92/230					93/229		
68	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909*	1910*	1911*	1912*	1913*	1914*	1915*	1916*	1917*	1918*	1919*	1920*	1921*
66	2082.	2083.	2084.	2085.	2086.	2087.	2088.	2089.	2090.	2091.	2092.	2093.	2094.	2095.	2096.	2097.	2098.	2099.	2100.	2101.
64	2262.	2263.	2264.	2265.	2266.	2267.	2268.	2269.	2270.	2271.	2272.	2273.	2274.	2275.	2276.	2277.	2278.	2279.	2280.	2281.
62	2442.	2443.	2444.	2445.	2446.	2447.	2448.	2449.	2450.	2451.	2452.	2453.	2454.	2455.	2456.	2457.	2458.	2459.	2460.	2461.
60	2622.	2623.	2624.	2625*	2626	2627	2628	2629*	2630*	2631*	2632.	2633.	2634.	2635.	2636.	2637.	2638.	2639.	2640.	2641.
			126/196					127/195					128/194					129/193		
58	2802*	2803*	2804*	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814*	2815*	2816.	2817.	2818.	2819.	2820.	2821.
56	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996*	2997.	2998.	2999.	3000.	3001.
54	3162	3163	3164	3165	3166	3167	3168	3169	3170	3171	3172	3173	3174	3175	3176	3177*	3178.	3179.	3180.	3181.
52	3342	3343	3344	3345	3346	3347	3348	3349	3350	3351	3352	3353	3354	3355	3356	3357	3358*	3359.	3360.	3361.
50	3522	3523	3524	3525	3526	3527	3528	3529	3530	3531	3532	3533	3534	3535	3536	3537	3538	3539*	3540*	3541.
			162/160					163/159					164/158					165/157		
48	3702	3703	3704	3705	3706	3707	3708	3709	3710	3711	3712	3713	3714	3715	3716	3717	3718	3719	3720	3721.
46	3882	3883	3884	3885	3886	3887	3888	3889	3890	3891	3892	3893	3894	3895	3896	3897	3898	3899	3900*	3901.
44	4062	4063	4064	4065	4066	4067	4068	4069	4070	4071	4072	4073	4074	4075	4076	4077	4078	4079	4080*	4081.
42	4242	4243	4244	4245	4246	4247	4248	4249	4250	4251	4252	4253	4254	4255	4256	4257	4258	4259	4260.	4261.
40	4422	4423	4424	4425	4426	4427	4428	4429	4430	4431	4432	4433	4434	4435	4436	4437	4438	4439	4440.	4441.
			198/124					199/123					200/122					201/121		
38	4602	4603	4604	4605	4606	4607	4608	4609	4610	4611	4612	4613	4614	4615	4616	4617	4618	4619	4620*	4621.
36	4782	4783	4784	4785	4786	4787	4788	4789	4790	4791	4792	4793	4794	4795	4796	4797	4798	4799	4800	4801*
34	4962	4963	4964	4965	4966	4967	4968	4969	4970	4971	4972	4973	4974	4975	4976	4977	4978	4979	4980	4981
32	5142	5143	5144	5145	5146	5147	5148	5149	5150	5151	5152	5153	5154	5155	5156	5157	5158	5159	5160	5161
30	5322	5323	5324	5325	5326	5327	5328	5329	5330	5331	5332	5333	5334	5335	5336	5337	5338	5339	5340	5341
			234/ 88					235/ 87					236/ 86					237/ 85		
28	5502	5503	5504	5505	5506	5507	5508	5509	5510	5511	5512	5513	5514	5515	5516	5517	5518	5519	5520	5521
26	5682	5683	5684	5685	5686	5687	5688	5689	5690	5691	5692	5693	5694	5695	5696	5697	5698	5699	5700	5701
24	5862	5863	5864	5865	5866	5867	5868	5869	5870	5871	5872	5873	5874	5875	5876	5877	5878	5879	5880	5881
22	6042	6043	6044	6045	6046	6047	6048	6049	6050	6051	6052	6053	6054	6055	6056	6057	6058	6059	6060	6061
20	6222	6223	6224	6225	6226	6227	6228	6229	6230	6231	6232	6233	6234	6235	6236	6237	6238	6239	6240	6241
			270/ 52					271/ 51					272/ 50					273/ 49		
18	6402	6403	6404	6405	6406	6407	6408	6409	6410	6411	6412	6413	6414	6415	6416	6417	6418	6419	6420	6421
16	6582	6583	6584	6585	6586	6587	6588	6589	6590	6591	6592	6593	6594	6595	6596	6597	6598	6599	6600	6601
14	6762	6763	6764	6765	6766	6767	6768	6769	6770	6771	6772	6773	6774	6775	6776	6777	6778	6779	6780	6781
12	6942	6943	6944	6945	6946	6947	6948	6949	6950	6951	6952	6953	6954	6955	6956	6957	6958	6959	6960	6961
10	7122	7123	7124	7125	7126	7127	7128	7129	7130	7131	7132	7133	7134	7135	7136	7137	7138	7139	7140	7141
			306/ 16					307/ 15					308/ 14					309/ 13		
8	7302	7303	7304	7305	7306	7307	7308	7309	7310	7311	7312	7313	7314	7315	7316	7317	7318	7319	7320	7321
6	7482	7483	7484	7485	7486	7487	7488	7489	7490	7491	7492	7493	7494	7495	7496	7497	7498	7499	7500	7501
4	7662	7663	7664	7665	7666	7667	7668	7669	7670	7671	7672	7673	7674	7675	7676	7677	7678	7679	7680	7681
2	7842	7843	7844	7845	7846	7847	7848	7849	7850	7851	7852	7853	7854	7855	7856	7857	7858	7859	7860	7861
0	8022	8023	8024	8025	8026	8027	8028	8029	8030	8031	8032	8033	8034	8035	8036	8037	8038	8039	8040	8041

ALASKA

N. AMERICA

PACIFIC OCEAN

PACIFIC OCEAN

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.OIC. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2
FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 7 OF 18

LAT \ LONG->	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278
	-80*10/*50*		22/912					23/911					24/910					25/909		
88	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141
86	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321
84	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501
82	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681
80	842	843	844	845	846	847	848	849	850	851	852	853	854	855*	856	857	858	859*	860*	861*
			58/264					59/263					50/262					61/261		
78	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036*	1037*	1038	1039	1040*	1041*
76	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221
74	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401
72	1562*	1563	1564*	1565	1566	1567	1568*	1569	1570	1571	1572*	1573	1574	1575*	1576	1577*	1578*	1579	1580*	1581
70	1742	1743	1744*	1745*	1746*	1747*	1748*	1749*	1750	1751	1752	1753	1754*	1755	1756	1757	1758	1759	1760*	1761*
			94/228					95/227					96/226					97/225		
68	1922*	1923	1924	1925*	1926*	1927*	1928	1929	1930	1931	1932	1933	1934	1935*	1936*	1937	1938	1939	1940*	1941
66	2102.	2103.	2104*	2105*	2106*	2107*	2108*	2109*	2110*	2111*	2112*	2113*	2114*	2115.	2116*	2117*	2118*	2119*	2120*	2121
64	2282.	2283.	2284.	2285.	2286.	2287.	2288.	2289.	2290.	2291.	2292.	2293.	2294.	2295.	2296*	2297	2298	2299*	2300	2301
62	2462.	2463.	2464.	2465.	2466.	2467.	2468.	2469.	2470.	2471.	2472.	2473.	2474.	2475*	2476	2477	2478	2479	2480	2481
60	2642.	2643.	2644.	2645.	2646.	2647.	2648.	2649.	2650.	2651.	2652.	2653.	2654*	2655	2656	2657	2658	2659	2660	2661
			130/192					131/191					132/190					133/189		
58	2822.	2823.	2824.	2825.	2826.	2827.	2828.	2829.	2830.	2831.	2832.	2833.	2834*	2835	2836	2837	2838	2839	2840	2841
56	3002.	3003.	3004.	3005.	3006.	3007.	3008.	3009.	3010.	3011.	3012.	3013.	3014.	3015*	3016*	3017	3018	3019	3020	3021
54	3182.	3183.	3184.	3185.	3186.	3187.	3188.	3189.	3190.	3191.	3192.	3193.	3194.	3195.	3196.	3197.	3198*	3199*	3200*	3201
52	3362.	3363.	3364.	3365.	3366.	3367.	3368.	3369.	3370.	3371.	3372.	3373.	3374.	3375.	3376.	3377.	3378.	3379.	3380*	3381
50	3542.	3543.	3544.	3545.	3546.	3547.	3548.	3549.	3550.	3551.	3552.	3553.	3554.	3555.	3556.	3557.	3558.	3559.	3560.	3561*
			166/156					167/155					168/154					169/153		
48	3722.	3723.	3724.	3725.	3726.	3727.	3728.	3729.	3730.	3731.	3732.	3733.	3734.	3735.	3736.	3737*	3738*	3739*	3740.	3741.
46	3902.	3903.	3904.	3905.	3906.	3907.	3908.	3909.	3910.	3911.	3912.	3913.	3914.	3915*	3916	3917	3918	3919	3920*	3921*
44	4082.	4083.	4084.	4085.	4086.	4087.	4088.	4089.	4090.	4091.	4092.	4093.	4094.	4095*	4096*	4097*	4098	4099*	4100	4101
42	4262.	4263.	4264.	4265.	4266.	4267.	4268.	4269.	4270.	4271.	4272.	4273.	4274.	4275.	4276*	4277.	4278	4279.	4280	4281*
40	4442.	4443.	4444.	4445.	4446.	4447.	4448.	4449.	4450.	4451.	4452.	4453.	4454.	4455.	4456	4457.	4458*	4459.	4460*	4461*
			202/120					203/119					204/118					205/117		
38	4622.	4623.	4624.	4625.	4626.	4627.	4628.	4629.	4630.	4631.	4632.	4633.	4634.	4635.	4636.	4637.	4638.	4639.	4640.	4641.
36	4802.	4803.	4804.	4805.	4806.	4807.	4808.	4809.	4810.	4811.	4812.	4813.	4814.	4815.	4816.	4817.	4818.	4819.	4820.	4821.
34	4982*	4983.	4984.	4985.	4986.	4987.	4988.	4989.	4990.	4991.	4992.	4993.	4994.	4995.	4996.	4997.	4998.	4999.	5000.	5001.
32	5162	5163*	5164.	5165.	5166.	5167.	5168.	5169.	5170.	5171.	5172.	5173.	5174.	5175.	5176.	5177.	5178.	5179.	5180.	5181*
30	5342	5343	5344*	5345*	5346.	5347.	5348.	5349.	5350.	5351.	5352.	5353.	5354.	5355.	5356*	5357*	5358*	5359*	5360*	5361
			238/ 84					239/ 83					240/ 82					241/ 81		
28	5522	5523	5524	5525	5526*	5527.	5528.	5529.	5530.	5531.	5532.	5533*	5534	5535	5536	5537	5538	5539	5540	5541*
26	5702	5703	5704	5705	5706	5707*	5708.	5709.	5710.	5711.	5712.	5713	5714	5715	5716	5717	5718	5719	5720	5721
24	5882	5883	5884	5885	5886	5887	5888*	5889.	5890.	5891.	5892.	5893	5894	5895	5896	5897	5898	5899	5900	5901
22	6062	6063	6064	6065	6066	6067	6068	6069*	6070.	6071.	6072.	6073	6074	6075	6076	6077	6078	6079	6080	6081
20	6242	6243	6244	6245	6246	6247	6248	6249*	6250.	6251.	6252.	6253	6254	6255	6256	6257	6258	6259	6260	6261
			274/ 48					275/ 47					276/ 46					277/ 45		
18	6422	6423	6424	6425	6426	6427	6428	6429	6430*	6431.	6432.	6433*	6434	6435	6436*	6437*	6438	6439	6440	6441
16	6602	6603	6604	6605	6606	6607	6608	6609	6610	6611	6612*	6613*	6614*	6615*	6616.	6617*	6618	6619	6620	6621
14	6782	6783	6784	6785	6786	6787	6788	6789	6790	6791	6792	6793	6794	6795	6796*	6797*	6798*	6799*	6800	6801
12	6962	6963	6964	6965	6966	6967	6968	6969	6970	6971	6972	6973	6974	6975	6976	6977	6978*	6979.	6980	6981
10	7142	7143	7144	7145	7146	7147	7148	7149	7150	7151	7152	7153	7154	7155	7156	7157	7158	7159*	7160	7161
			310/ 12					311/ 11					312/ 10					313/ 9		
8	7322	7323	7324	7325	7326	7327	7328	7329	7330	7331	7332	7333	7334	7335	7336	7337	7338	7339	7340	7341
6	7502	7503	7504	7505	7506	7507	7508	7509	7510	7511	7512	7513	7514	7515	7516	7517	7518	7519	7520	7521
4	7682	7683	7684	7685	7686	7687	7688	7689	7690	7691	7692	7693	7694	7695	7696	7697	7698	7699	7700	7701
2	7862	7863	7864	7865	7866	7867	7868	7869	7870	7871	7872	7873	7874	7875	7876	7877	7878	7879	7880	7881
0	8042	8043	8044	8045	8046	8047	8048	8049	8050	8051	8052	8053	8054	8055	8056	8057	8058	8059	8060	8061

Handwritten region labels: ARCTIC OCEAN; HUDSON BAY; GREAT LAKES; UNITED STATES; N. AMERICA; PACIFIC OCEAN

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 8 OF 18

LAT \ LONG->	280	282	284	286	288	290	292	294	296	298	300	302	304	306	308	310	312	314	316	318
BOX10/MSQ=			26/908					27/907					28/905					29/905		
88	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161
86	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341
84	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521
82	682*	683*	684*	685*	686*	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701
80	862	863	864*	865.	866*	867	868	869	870*	871*	872*	873.	874.	875*	876*	877.	878*	879*	880*	881.
			67/260					63/259					64/258					65/257		
78	1042*	1043	1044	1045	1046	1047	1048*	1049*	1050.	1051.	1052.	1053.	1054.	1055.	1056.	1057.	1058.	1059.	1060.	1061.
76	1222	1223	1224	1225	1226	1227	1228	1229*	1230*	1231*	1232.	1233.	1234.	1235.	1236.	1237.	1238.	1239.	1240.	1241.
74	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413*	1414*	1415.	1416.	1417.	1418.	1419.	1420.	1421.
72	1582	1583	1584	1585	1586	1587	1588	1589	1590	1591	1592	1593	1594	1595*	1596.	1597.	1598.	1599.	1600.	1601.
70	1762	1763*	1764*	1765*	1766	1767	1768	1769	1770	1771	1772	1773	1774	1775	1776	1777.	1778.	1779.	1780.	1781.
			98/224					99/223					100/222					101/221		
68	1942	1943	1944	1945*	1946.	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957.	1958.	1959.	1960.	1961.
66	2122	2123	2124	2125	2126.	2127*	2128*	2129	2130	2131	2132	2133	2134	2135	2136	2137.	2138.	2139.	2140.	2141.
64	2302	2303	2304	2305*	2306.	2307*	2308*	2309	2310	2311	2312	2313	2314	2315	2316	2317*	2318.	2319.	2320.	2321
62	2482	2483	2484	2485	2486	2487*	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497*	2498.	2499.	2500*	2501
60	2662	2663*	2664.	2665*	2666*	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679*	2680	2681
			134/188					135/187					136/186					137/185		
58	2842	2843*	2844.	2845.	2846.	2847	2848	2849*	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861
56	3022	3023	3024.	3025.	3026.	3027*	3028.	3029.	3030*	3031	3032	3033	3034	3035	3036	3037	3038	3039	3040	3041
54	3202	3203*	3204.	3205.	3206.	3207.	3208.	3209.	3210.	3211*	3212	3213	3214	3215	3216	3217	3218	3219	3220	3221
52	3382	3383.	3384.	3385.	3386.	3387.	3388.	3389.	3390.	3391*	3392*	3393*	3394	3395	3396	3397	3398	3399	3400	3401
50	3562*	3563.	3564.	3565.	3566.	3567.	3568*	3569*	3570*	3571*	3572*	3573	3574	3575	3576	3577	3578	3579	3580	3581
			170/152					171/151					172/150					173/149		
48	3742.	3743.	3744.	3745.	3746.	3747*	3748	3749	3750	3751	3752	3753*	3754*	3755	3756	3757	3758	3759	3760	3761
46	3922.	3923.	3924.	3925*	3926*	3927*	3928*	3929	3930	3931	3932	3933	3934	3935	3936	3937	3938	3939	3940	3941
44	4102*	4103*	4104*	4105*	4106.	4107*	4108	4109	4110	4111	4112	4113	4114	4115	4116	4117	4118	4119	4120	4121
42	4282	4283*	4284.	4285.	4286*	4287	4288	4289	4290	4291	4292	4293	4294	4295	4296	4297	4298	4299	4300	4301
40	4462.	4463.	4464*	4465	4466	4467	4468	4469	4470	4471	4472	4473	4474	4475	4476	4477	4478	4479	4480	4481
			206/116					207/115					208/114					209/113		
38	4642.	4643*	4644	4645	4646	4647	4648	4649	4650	4651	4652	4653	4654	4655	4656	4657	4658	4659	4660	4661
36	4822.	4823*	4824	4825	4826	4827	4828	4829	4830	4831	4832	4833	4834	4835	4836	4837	4838	4839	4840	4841
34	5002.	5003	5004	5005	5006	5007	5008	5009	5010	5011	5012	5013	5014	5015	5016	5017	5018	5019	5020	5021
32	5182	5183	5184	5185	5186	5187	5188	5189	5190	5191	5192	5193	5194	5195	5196	5197	5198	5199	5200	5201
30	5362	5363	5364	5365	5366	5367	5368	5369	5370	5371	5372	5373	5374	5375	5376	5377	5378	5379	5380	5381
			242/ 80					243/ 79					244/ 78					245/ 77		
28	5542	5543	5544	5545	5546	5547	5548	5549	5550	5551	5552	5553	5554	5555	5556	5557	5558	5559	5560	5561
26	5722	5723	5724	5725	5726	5727	5728	5729	5730	5731	5732	5733	5734	5735	5736	5737	5738	5739	5740	5741
24	5902	5903	5904	5905	5906	5907	5908	5909	5910	5911	5912	5913	5914	5915	5916	5917	5918	5919	5920	5921
22	6082	6083	6084	6085	6086	6087	6088	6089	6090	6091	6092	6093	6094	6095	6096	6097	6098	6099	6100	6101
20	6262	6263	6264	6265	6266	6267	6268	6269	6270	6271	6272	6273	6274	6275	6276	6277	6278	6279	6280	6281
			278/ 44					279/ 43					280/ 42					281/ 41		
18	6442	6443	6444	6445	6446	6447	6448	6449	6450	6451	6452	6453	6454	6455	6456	6457	6458	6459	6460	6461
16	6622	6623	6624	6625	6626	6627	6628	6629	6630	6631	6632	6633	6634	6635	6636	6637	6638	6639	6640	6641
14	6802	6803	6804	6805	6806	6807	6808	6809	6810	6811	6812	6813	6814	6815	6816	6817	6818	6819	6820	6821
12	6982	6983	6984	6985	6986	6987	6988	6989	6990	6991	6992	6993	6994	6995	6996	6997	6998	6999	7000	7001
10	7162	7163	7164	7165*	7166*	7167*	7168	7169	7170	7171	7172	7173	7174	7175	7176	7177	7178	7179	7180	7181
			314/ 8					315/ 7					316/ 6					317/ 5		
8	7342	7343	7344*	7345*	7346*	7347.	7348.	7349.	7350*	7351*	7352	7353	7354	7355	7356	7357	7358	7359	7360	7361
6	7522	7523*	7524.	7525.	7526.	7527.	7528.	7529.	7530.	7531.	7532*	7533	7534	7535	7536	7537	7538	7539	7540	7541
4	7702	7703*	7704.	7705.	7706.	7707.	7708.	7709.	7710.	7711.	7712.	7713*	7714*	7715*	7716	7717	7718	7719	7720	7721
2	7882	7883*	7884.	7885.	7886.	7887.	7888.	7889.	7890.	7891.	7892.	7893.	7894.	7895.	7896*	7897	7898	7899	7900	7901
0	8062*	8063.	8064.	8065.	8066.	8067.	8068.	8069.	8070.	8071.	8072.	8073.	8074.	8075.	8076*	8077	8078	8079	8080	8081

ARCTIC OCEAN GREENLAND HUDSON BAY N. AMERICA ATLANTIC OCEAN S. AMERICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 9 OF 18

LAT \ LONG->	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358
BOX10/MSQ=			30/904					31/903					32/902					33/901		
88	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181
86	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361
84	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541
82	702*	703*	704*	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721
80	882.	883.	884.	885*	886*	887*	888*	889*	890*	891*	892	893	894	895	896	897	898	899	900	901
			66/256					67/255					68/254					69/253		
78	1062.	1063.	1064.	1065.	1066.	1067.	1068.	1069.	1070.	1071*	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081
76	1242.	1243.	1244.	1245.	1246.	1247.	1248.	1249.	1250*	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261
74	1422.	1423.	1424.	1425.	1426.	1427.	1428.	1429.	1430*	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441
72	1602.	1603.	1604.	1605.	1606.	1607*	1608	1609	1610	1611	1612	1613	1614	1615	1616	1617	1618	1619	1620	1621
70	1782.	1783.	1784.	1785.	1786.	1787*	1788	1789	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801
			102/220					103/219					104/218					105/217		
68	1962.	1963.	1964.	1965*	1966*	1967*	1968*	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
66	2142.	2143*	2144*	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161
64	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332*	2333*	2334*	2335	2336	2337	2338	2339	2340	2341
62	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521
60	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701
			138/184					139/183					140/182					141/181		
58	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881
56	3042	3043	3044	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057	3058	3059	3060	3061
54	3222	3223	3224	3225	3226	3227	3228	3229	3230	3231	3232	3233	3234	3235	3236	3237	3238*	3239	3240	3241
52	3402	3403	3404	3405	3406	3407	3408	3409	3410	3411	3412	3413	3414	3415	3416	3417*	3418*	3419	3420*	3421*
50	3582	3583	3584	3585	3586	3587	3588	3589	3590	3591	3592	3593	3594	3595	3596	3597	3598	3599	3600	3601*
			174/148					175/147					176/146					177/145		
48	3762	3763	3764	3765	3766	3767	3768	3769	3770	3771	3772	3773	3774	3775	3776	3777	3778	3779	3780	3781*
46	3942	3943	3944	3945	3946	3947	3948	3949	3950	3951	3952	3953	3954	3955	3956	3957	3958	3959	3960	3961*
44	4122	4123	4124	4125	4126	4127	4128	4129	4130	4131	4132	4133	4134	4135	4136	4137	4138	4139	4140	4141
42	4302	4303	4304	4305	4306	4307	4308	4309	4310	4311	4312	4313	4314	4315	4316	4317	4318*	4319*	4320*	4321*
40	4482	4483	4484	4485	4486	4487	4488	4489	4490	4491	4492	4493	4494	4495	4496	4497	4498.	4499.	4500.	4501.
			210/112					211/111					212/110					213/109		
38	4662	4663	4664	4665	4666	4667	4668	4669	4670	4671	4672	4673	4674	4675	4676	4677	4678.	4679.	4680.	4681*
36	4842	4843	4844	4845	4846	4847	4848	4849	4850	4851	4852	4853	4854	4855	4856	4857	4858	4859*	4860*	4861
34	5022	5023	5024	5025	5026	5027	5028	5029	5030	5031	5032	5033	5034	5035	5036	5037	5038	5039*	5040*	5041*
32	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211	5212	5213	5214	5215	5216	5217	5218*	5219.	5220.	5221.
30	5382	5383	5384	5385	5386	5387	5388	5389	5390	5391	5392	5393	5394	5395	5396	5397*	5398.	5399.	5400.	5401.
			246/ 76					247/ 75					248/ 74					249/ 73		
28	5562	5563	5564	5565	5566	5567	5568	5569	5570	5571	5572	5573	5574	5575	5576	5577*	5578.	5579.	5580.	5581.
26	5742	5743	5744	5745	5746	5747	5748	5749	5750	5751	5752	5753	5754	5755*	5756.	5757.	5758.	5759.	5760.	5761.
24	5922	5923	5924	5925	5926	5927	5928	5929	5930	5931	5932	5933	5934	5935.	5936.	5937.	5938.	5939.	5940.	5941.
22	6102	6103	6104	6105	6106	6107	6108	6109	6110	6111	6112	6113	6114*	6115.	6116.	6117.	6118.	6119.	6120.	6121.
20	6282	6283	6284	6285	6286	6287	6288	6289	6290	6291	6292	6293	6294.	6295.	6296.	6297.	6298.	6299.	6300.	6301.
			282/ 40					283/ 39					284/ 38					285/ 37		
18	6462	6463	6464	6465	6466	6467	6468	6469	6470	6471	6472	6473	6474.	6475.	6476.	6477.	6478.	6479.	6480.	6481.
16	6642	6643	6644	6645	6646	6647	6648	6649	6650	6651	6652	6653	6654.	6655.	6656.	6657.	6658.	6659.	6660.	6661.
14	6822	6823	6824	6825	6826	6827	6828	6829	6830	6831	6832	6833	6834.	6835.	6836.	6837.	6838.	6839.	6840.	6841.
12	7002	7003	7004	7005	7006	7007	7008	7009	7010	7011	7012	7013	7014*	7015.	7016.	7017.	7018.	7019.	7020.	7021.
10	7182	7183	7184	7185	7186	7187	7188	7189	7190	7191	7192	7193	7194	7195.	7196.	7197.	7198.	7199.	7200.	7201.
			318/ 4					319/ 3					320/ 2					321/ 1		
8	7362	7363	7364	7365	7366	7367	7368	7369	7370	7371	7372	7373	7374	7375*	7376.	7377.	7378.	7379.	7380.	7381.
6	7542	7543	7544	7545	7546	7547	7548	7549	7550	7551	7552	7553	7554	7555	7556*	7557.	7558.	7559.	7560.	7561.
4	7722	7723	7724	7725	7726	7727	7728	7729	7730	7731	7732	7733	7734	7735	7736	7737*	7738*	7739	7740	7741
2	7902	7903	7904	7905	7906	7907	7908	7909	7910	7911	7912	7913	7914	7915	7916	7917	7918	7919	7920	7921
0	8082	8083	8084	8085	8086	8087	8088	8089	8090	8091	8092	8093	8094	8095	8096	8097	8098	8099	8100	8101

ARCTIC OCEAN — GREENLAND — ATLANTIC OCEAN — EUROPE — AFRICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.OIC. 83/11/08. 16.43.47.

Table G2-1 (continued)

AFRICA — INDIAN OCEAN — ATLANTIC OCEAN — ANTARCTICA

```
                                 TABLE OF BOX2                    FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 10
                                 *************                    ******************************************** OF  18
LAT  LONG->
     I   0      2      4      6      8   I  10     12     14     16     18  I  20     22     24     26     28  I  30     32     34     36     38
     I-BOX10/MSQ=358/335 ------------I---------- 359/334 -----------I---------- 350/333 -----------I---------- 325/332 -----------I
  -2I 8102   8103   8104   8105   8106   8107.  8108.  8109.  8110.  8111.I 8112.  8113.  8114.  8115.  8116.I 8117.  8118.  8119.  8120.  8121.
  -4I 8282   8283   8284   8285   8286 I 8287*  8288.  8289.  8290.  8291.I 8292.  8293.  8294.  8295.  8296.I 8297.  8298.  8299.  8300.  8301*I
  -6I 8462   8463   8464   8465   8466 I 8467   8468*  8469.  8470.  8471.I 8472.  8473.  8474.  8475.  8476.I 8477.  8478.  8479.  8480.  8481*I
  -8I 8642   8643   8644   8645   8646 I 8647   8648*  8649.  8650.  8651.I 8652.  8653.  8654.  8655.  8656.I 8657.  8658.  8659.  8660.  8661*I
 -10I 8822   8823   8824   8825   8826 I 8827   8828   8829.  8830.  8831.I 8832.  8833.  8834.  8835.  8836.I 8837.  8838.  8839.  8840.  8841*I
     I---------- 394/371 ------------I---------- 395/370 -----------I---------- 396/369 -----------I---------- 361/368 -----------I
 -12I 9002   9003   9004   9005   9006 I 9007   9008   9009.  9010.  9011.I 9012.  9013.  9014.  9015.  9016.I 9017.  9018.  9019.  9020.  9021*I
 -14I 9182   9183   9184   9185   9186 I 9187   9188*  9189.  9190.  9191.I 9192.  9193.  9194.  9195.  9196.I 9197.  9198.  9199.  9200.  9201.I
 -16I 9362   9363   9364   9365   9366 I 9367   9368*  9369.  9370.  9371.I 9372.  9373.  9374.  9375.  9376.I 9377.  9378.  9379.  9380.  9381.I
 -18I 9542   9543   9544   9545   9546 I 9547   9548.  9549.  9550.  9551.I 9552.  9553.  9554.  9555.  9556.I 9557.  9558.  9559.  9560*  9561*I
 -20I 9722   9723   9724   9725   9726 I 9727   9728*  9729.  9730.  9731.I 9732.  9733.  9734.  9735.  9736.I 9737.  9738.  9739*  9740   9741 I
     I---------- 430/407 ------------I---------- 431/406 -----------I---------- 432/405 -----------I---------- 397/404 -----------I
 -22I 9902   9903   9904   9905   9906 I 9907   9908   9909*  9910.  9911.I 9912.  9913.  9914.  9915.  9916.I 9917.  9918.  9919*  9920   9921 I
 -24I10082  10083  10084  10085  10086 I10087  10088  10089*10090.10091.I10092.10093.10094.10095.10096.I10097.10098.10099*10100  10101 I
 -26I10262  10263  10264  10265  10266 I10267  10268  10269*10270.10271.I10272.10273.10274.10275.10276.I10277.10278*10279  10280  10281 I
 -28I10442  10443  10444  10445  10446 I10447  10448  10449 10450.10451.I10452.10453.10454.10455.10456.I10457*10458  10459  10460  10461 I
 -30I10622  10623  10624  10625  10626 I10627  10628  10629  10630*10631.I10632.10633.10634.10635.10636.I10637*10638  10639  10640  10641 I
     I---------- 466/443 ------------I---------- 467/442 -----------I---------- 468/441 -----------I---------- 433/440 -----------I
 -32I10802  10803  10804  10805  10806 I10807  10808  10809  10810  10811*I10812.10813.10814.10815.10816*I10817  10818  10819  10820  10821 I
 -34I10982  10983  10984  10985  10986 I10987  10988  10989  10990  10991*I10992.10993*10994*10995*10996 I10997  10998  10999  11000  11001 I
 -36I11162  11163  11164  11165  11166 I11167  11168  11169  11170  11171 I11172  11173  11174  11175  11176 I11177  11178  11179  11180  11181 I
 -38I11342  11343  11344  11345  11346 I11347  11348  11349  11350  11351 I11352  11353  11354  11355  11356 I11357  11358  11359  11360  11361 I
 -40I11522  11523  11524  11525  11526 I11527  11528  11529  11530  11531 I11532  11533  11534  11535  11536 I11537  11538  11539  11540  11541 I
     I---------- 502/479 ------------I---------- 503/478 -----------I---------- 504/477 -----------I---------- 469/476 -----------I
 -42I11702  11703  11704  11705  11706 I11707  11708  11709  11710  11711 I11712  11713  11714  11715  11716 I11717  11718  11719  11720  11721 I
 -44I11882  11883  11884  11885  11886 I11887  11888  11889  11890  11891 I11892  11893  11894  11895  11896 I11897  11898  11899  11900  11901 I
 -46I12062  12063  12064  12065  12066 I12067  12068  12069  12070  12071 I12072  12073  12074  12075  12076 I12077  12078  12079  12080  12081 I
 -48I12242  12243  12244  12245  12246 I12247  12248  12249  12250  12251 I12252  12253  12254  12255  12256 I12257  12258  12259  12260  12261 I
 -50I12422  12423  12424  12425  12426 I12427  12428  12429  12430  12431 I12432  12433  12434  12435  12436 I12437  12438  12439  12440  12441 I
     I---------- 538/515 ------------I---------- 539/514 -----------I---------- 540/513 -----------I---------- 505/512 -----------I
 -52I12602  12603  12604  12605  12606 I12607  12608  12609  12610  12611 I12612  12613  12614  12615  12616 I12617  12618  12619  12620  12621 I
 -54I12782  12783  12784  12785  12786 I12787  12788  12789  12790  12791 I12792  12793  12794  12795  12796 I12797  12798  12799  12800  12801 I
 -56I12962  12963  12964  12965  12966 I12967  12968  12969  12970  12971 I12972  12973  12974  12975  12976 I12977  12978  12979  12980  12981 I
 -58I13142  13143  13144  13145  13146 I13147  13148  13149  13150  13151 I13152  13153  13154  13155  13156 I13157  13158  13159  13160  13161 I
 -60I13322  13323  13324  13325  13326 I13327  13328  13329  13330  13331 I13332  13333  13334  13335  13336 I13337  13338  13339  13340  13341 I
     I---------- 574/551 ------------I---------- 575/550 -----------I---------- 576/549 -----------I---------- 541/548 -----------I
 -62I13502  13503  13504  13505  13506 I13507  13508  13509  13510  13511 I13512  13513  13514  13515  13516 I13517  13518  13519  13520  13521 I
 -64I13682  13683  13684  13685  13686 I13687  13688  13689  13690  13691 I13692  13693  13694  13695  13696 I13697  13698  13699  13700  13701 I
 -66I13862  13863  13864  13865  13866 I13867  13868  13869  13870  13871 I13872  13873  13874  13875  13876 I13877  13878  13879  13880  13881 I
 -68I14042  14043  14044  14045  14046 I14047  14048  14049  14050  14051 I14052  14053  14054  14055  14056 I14057  14058  14059  14060  14061 I
 -70I14222  14223  14224  14225  14226 I14227  14228  14229  14230  14231 I14232  14233  14234  14235  14236 I14237  14238  14239  14240  14241 I
     I---------- 610/587 ------------I---------- 611/586 -----------I---------- 612/585 -----------I---------- 577/584 -----------I
 -72I14402  14403*14404*14405*14406*I14407.14408*14409*14410*14411*I14412*14413*14414*14415*14416*I14417.14418.14419.14420.14421.I
 -74I14582.14583.14584.14585.14586.I14587.14588.14589.14590.14591.I14592.14593.14594.14595.14596.I14597.14598.14599.14600.14601.I
 -76I14762.14763.14764.14765.14766.I14767.14768.14769.14770.14771.I14772.14773.14774.14775.14776.I14777.14778.14779.14780.14781.I
 -78I14942.14943.14944.14945.14946.I14947.14948.14949.14950.14951.I14952.14953.14954.14955.14956.I14957.14958.14959.14960.14961.I
 -80I15122.15123.15124.15125.15126.I15127.15128.15129.15130.15131.I15132.15133.15134.15135.15136.I15137.15138.15139.15140.15141.I
     I---------- 646/623 ------------I---------- 647/622 -----------I---------- 648/621 -----------I---------- 613/620 -----------I
 -82I15302.15303.15304.15305.15306.I15307.15308.15309.15310.15311.I15312.15313.15314.15315.15316.I15317.15318.15319.15320.15321.I
 -84I15482.15483.15484.15485.15486.I15487.15488.15489.15490.15491.I15492.15493.15494.15495.15496.I15497.15498.15499.15500.15501.I
 -86I15662.15663.15664.15665.15666.I15667.15668.15669.15670.15671.I15672.15673.15674.15675.15676.I15677.15678.15679.15680.15681.I
 -88I15842.15843.15844.15845.15846.I15847.15848.15849.15850.15851.I15852.15853.15854.15855.15856.I15857.15858.15859.15860.15861.I
 -90I16022.16023.16024.16025.16026.I16027.16028.16029.16030.16031.I16032.16033.16034.16035.16036.I16037.16038.16039.16040.16041.I
     I-------------------------------I-------------------------------I-------------- (S.POLE)=16202.I-------------------------------I
NORTH POLE BOX2 NO.=1               THE SPACE FOLLOWING <BOX2>:        0 <= LONGITUDE <= 358 EAST      THIS IS FILE <BX2TAF>
SOUTH POLE BOX2 NO.=16202           <.>=LAND, <*>=COASTAL, < >=SEA   -90 <= LATITUDE  <= 90 NORTH      OUTPUT OF <BX2TA>
                                    LANDLOCK FILE=LLN2F1                                                .01C.  83/11/08. 16.43.47.
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Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 11 OF 18

INDIAN OCEAN — ANTARCTICA

LAT \ LONG->	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
BOX10/MSQ=			326/331					327/330					328/329					329/328		
-2	8122	8123	8124	8125	8126	8127	8128	8129	8130	8131	8132	8133	8134	8135	8136	8137	8138	8139	8140	8141
-4	8302	8303	8304	8305	8306	8307	8308	8309	8310	8311	8312	8313	8314	8315	8316	8317	8318	8319	8320	8321
-6	8482	8483	8484	8485	8486	8487	8488	8489	8490	8491	8492	8493	8494	8495	8496	8497	8498	8499	8500	8501
-8	8662	8663	8664	8665	8666	8667	8668	8669	8670	8671	8672	8673	8674	8675	8676	8677	8678	8679	8680	8681
-10	8842	8843	8844	8845	8846	8847	8848	8849	8850	8851	8852	8853	8854	8855	8856	8857	8858	8859	8860	8861
			362/367					363/366					364/365					365/364		
-12	9022	9023	9024	9025	9026	9027	9028	9029	9030	9031	9032	9033	9034	9035	9036	9037	9038	9039	9040	9041
-14	9202	9203	9204	9205	9206	9207	9208	9209	9210	9211	9212	9213	9214	9215	9216	9217	9218	9219	9220	9221
-16	9382	9383	9384	9385	9386*	9387	9388	9389	9390	9391	9392	9393	9394	9395	9396	9397	9398	9399	9400	9401
-18	9562	9563	9564*	9565*	9566*	9567	9568	9569	9570	9571	9572	9573	9574	9575	9576	9577	9578	9579	9580	9581
-20	9742	9743	9744*	9745.	9746*	9747	9748	9749	9750	9751	9752	9753	9754	9755	9756	9757	9758	9759	9760	9761
			398/403					399/402					400/401					401/400		
-22	9922	9923	9924*	9925.	9926	9927	9928	9929	9930	9931	9932	9933	9934	9935	9936	9937	9938	9939	9940	9941
-24	10102	10103	10104.	10105*	10106	10107	10108	10109	10110	10111	10112	10113	10114	10115	10116	10117	10118	10119	10120	10121
-26	10282	10283	10284*	10285*	10286	10287	10288	10289	10290	10291	10292	10293	10294	10295	10296	10297	10298	10299	10300	10301
-28	10462	10463	10464	10465	10466	10467	10468	10469	10470	10471	10472	10473	10474	10475	10476	10477	10478	10479	10480	10481
-30	10642	10643	10644	10645	10646	10647	10648	10649	10650	10651	10652	10653	10654	10655	10656	10657	10658	10659	10660	10661
			434/439					435/438					436/437					437/436		
-32	10822	10823	10824	10825	10826	10827	10828	10829	10830	10831	10832	10833	10834	10835	10836	10837	10838	10839	10840	10841
-34	11002	11003	11004	11005	11006	11007	11008	11009	11010	11011	11012	11013	11014	11015	11016	11017	11018	11019	11020	11021
-36	11182	11183	11184	11185	11186	11187	11188	11189	11190	11191	11192	11193	11194	11195	11196	11197	11198	11199	11200	11201
-38	11362	11363	11364	11365	11366	11367	11368	11369	11370	11371	11372	11373	11374	11375	11376	11377	11378	11379	11380	11381
-40	11542	11543	11544	11545	11546	11547	11548	11549	11550	11551	11552	11553	11554	11555	11556	11557	11558	11559	11560	11561
			470/475					471/474					472/473					473/472		
-42	11722	11723	11724	11725	11726	11727	11728	11729	11730	11731	11732	11733	11734	11735	11736	11737	11738	11739	11740	11741
-44	11902	11903	11904	11905	11906	11907	11908	11909	11910	11911	11912	11913	11914	11915	11916	11917	11918	11919	11920	11921
-46	12082	12083	12084	12085	12086	12087	12088	12089	12090	12091	12092	12093	12094	12095	12096	12097	12098	12099	12100	12101
-48	12262	12263	12264	12265	12266	12267	12268	12269	12270	12271	12272	12273	12274	12275	12276	12277	12278	12279	12280	12281
-50	12442	12443	12444	12445	12446	12447	12448	12449	12450	12451	12452	12453	12454	12455	12456	12457	12458	12459	12460	12461
			506/511					507/510					508/509					509/508		
-52	12622	12623	12624	12625	12626	12627	12628	12629	12630	12631	12632	12633	12634	12635	12636	12637	12638	12639	12640	12641
-54	12802	12803	12804	12805	12806	12807	12808	12809	12810	12811	12812	12813	12814	12815	12816	12817	12818	12819	12820	12821
-56	12982	12983	12984	12985	12986	12987	12988	12989	12990	12991	12992	12993	12994	12995	12996	12997	12998	12999	13000	13001
-58	13162	13163	13164	13165	13166	13167	13168	13169	13170	13171	13172	13173	13174	13175	13176	13177	13178	13179	13180	13181
-60	13342	13343	13344	13345	13346	13347	13348	13349	13350	13351	13352	13353	13354	13355	13356	13357	13358	13359	13360	13361
			542/547					543/546					544/545					545/544		
-62	13522	13523	13524	13525	13526	13527	13528	13529	13530	13531	13532	13533	13534	13535	13536	13537	13538	13539	13540	13541
-64	13702	13703	13704	13705	13706	13707	13708	13709	13710	13711	13712	13713	13714	13715	13716	13717	13718	13719	13720	13721
-66	13882	13883	13884	13885	13886	13887	13888	13889	13890	13891	13892	13893	13894	13895	13896	13897	13898	13899	13900	13901
-68	14062	14063	14064	14065	14066	14067*	14068.	14069*	14070	14071	14072	14073	14074	14075	14076	14077	14078	14079	14080	14081
-70	14242*	14243*	14244.	14245.	14246.	14247.	14248.	14249.	14250.	14251.	14252.	14253.	14254.	14255.	14256*	14257*	14258*	14259	14260	14261*
			578/583					579/582					580/581					581/580		
-72	14422.	14423.	14424.	14425.	14426.	14427.	14428.	14429.	14430.	14431.	14432.	14433.	14434.	14435.	14436.	14437.	14438.	14439.	14440.	14441.
-74	14602.	14603.	14604.	14605.	14606.	14607.	14608.	14609.	14610.	14611.	14612.	14613.	14614.	14615.	14616.	14617.	14618.	14619.	14620.	14621.
-76	14782.	14783.	14784.	14785.	14786.	14787.	14788*	14789.	14790.	14791.	14792.	14793.	14794.	14795.	14796.	14797.	14798.	14799.	14800.	14801.
-78	14962.	14963.	14964.	14965.	14966.	14967.	14968.	14969.	14970.	14971.	14972.	14973.	14974.	14975.	14976.	14977.	14978.	14979.	14980.	14981.
-80	15142.	15143.	15144.	15145.	15146.	15147.	15148.	15149.	15150.	15151.	15152.	15153.	15154.	15155.	15156.	15157.	15158.	15159.	15160.	15161.
			614/619					615/618					616/617					617/616		
-82	15322.	15323.	15324.	15325.	15326.	15327.	15328.	15329.	15330.	15331.	15332.	15333.	15334.	15335.	15336.	15337.	15338.	15339.	15340.	15341.
-84	15502.	15503.	15504.	15505.	15506.	15507.	15508.	15509.	15510.	15511.	15512.	15513.	15514.	15515.	15516.	15517.	15518.	15519.	15520.	15521.
-86	15682.	15683.	15684.	15685.	15686.	15687.	15688.	15689.	15690.	15691.	15692.	15693.	15694.	15695.	15696.	15697.	15698.	15699.	15700.	15701.
-88	15862.	15863.	15864.	15865.	15866.	15867.	15868.	15869.	15870.	15871.	15872.	15873.	15874.	15875.	15876.	15877.	15878.	15879.	15880.	15881.
-90	16042.	16043.	16044.	16045.	16046.	16047.	16048.	16049.	16050.	16051.	16052.	16053.	16054.	16055.	16056.	16057.	16058.	16059.	16060.	16061.

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 12 OF 18

BORNEO

LAT \ LONG->	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118
BOX10/MSQ=			330/327					331/326					332/325					333/324		
-2	8142	8143	8144	8145	8146	8147	8148	8149	8150	8151	8152*	8153*	8154	8155	8156	8157*	8158.	8159.	8160	8161
-4	8322	8323	8324	8325	8326	8327	8328	8329	8330	8331	8332	8333*	8334*	8335	8336	8337	8338	8339*	8340	8341
-6	8502	8503	8504	8505	8506	8507	8508	8509	8510	8511	8512	8513	8514*	8515	8516	8517	8518	8519	8520	8521
-8	8682	8683	8684	8685	8685	8687	8688	8689	8690	8691	8692	8693	8694	8695	8696	8697*	8698	8699	8700	8701
-10	8862	8863	8864	8865	8865	8867	8868	8869	8870	8871	8872	8873	8874	8875	8876	8877	8878	8879	8880	8881
			366/363					367/362					368/361					369/360		
-12	9042	9043	9044	9045	9046	9047	9048	9049	9050	9051	9052	9053	9054	9055	9056	9057	9058	9059	9050	9061
-14	9222	9223	9224	9225	9226	9227	9228	9229	9230	9231	9232	9233	9234	9235	9236	9237	9238	9239	9240	9241
-16	9402	9403	9404	9405	9406	9407	9408	9409	9410	9411	9412	9413	9414	9415	9416	9417	9418	9419	9420	9421
-18	9582	9583	9584	9585	9586	9587	9588	9589	9590	9591	9592	9593	9594	9595	9596	9597	9598	9599	9600	9601
-20	9762	9763	9764	9765	9766	9767	9768	9769	9770	9771	9772	9773	9774	9775	9776	9777	9778	9779	9780	9781
			402/399					403/398					404/397					405/396		
-22	9942	9943	9944	9945	9946	9947	9948	9949	9950	9951	9952	9953	9954	9955	9956	9957	9958	9959	9960*	9961*
-24	10122	10123	10124	10125	10126	10127	10128	10129	10130	10131	10132	10133	10134	10135	10136	10137	10138	10139*	10140.	10141.
-26	10302	10303	10304	10305	10305	10307	10308	10309	10310	10311	10312	10313	10314	10315	10316	10317	10318	10319*	10320.	10321.
-28	10482	10483	10484	10485	10486	10487	10488	10489	10490	10491	10492	10493	10494	10495	10496	10497	10498	10499*	10500.	10501.
-30	10662	10663	10664	10665	10666	10667	10668	10669	10670	10671	10672	10673	10674	10675	10676	10677	10678	10679*	10680.	10681.
			438/435					439/434					440/433					441/432		
-32	10842	10843	10844	10845	10846	10847	10848	10849	10850	10851	10852	10853	10854	10855	10856	10857	10858	10859	10860.	10861.
-34	11022	11023	11024	11025	11026	11027	11028	11029	11030	11031	11032	11033	11034	11035	11036	11037	11038	11039	11040.	11041*
-36	11202	11203	11204	11205	11206	11207	11208	11209	11210	11211	11212	11213	11214	11215	11216	11217	11218	11219	11220	11221
-38	11382	11383	11384	11385	11386	11387	11388	11389	11390	11391	11392	11393	11394	11395	11396	11397	11398	11399	11400	11401
-40	11562	11563	11564	11565	11566	11567	11568	11569	11570	11571	11572	11573	11574	11575	11576	11577	11578	11579	11580	11581
			474/471					475/470					476/469					477/468		
-42	11742	11743	11744	11745	11746	11747	11748	11749	11750	11751	11752	11753	11754	11755	11756	11757	11758	11759	11760	11761
-44	11922	11923	11924	11925	11926	11927	11928	11929	11930	11931	11932	11933	11934	11935	11936	11937	11938	11939	11940	11941
-46	12102	12103	12104	12105	12106	12107	12108	12109	12110	12111	12112	12113	12114	12115	12116	12117	12118	12119	12120	12121
-48	12282	12283	12284	12285	12286	12287	12288	12289	12290	12291	12292	12293	12294	12295	12296	12297	12298	12299	12300	12301
-50	12462	12463	12464	12465	12465	12467	12468	12469	12470	12471	12472	12473	12474	12475	12476	12477	12478	12479	12480	12481
			510/507					511/506					512/505					513/504		
-52	12642	12643	12644	12645	12646	12647	12648	12649	12650	12651	12652	12653	12654	12655	12656	12657	12658	12659	12660	12661
-54	12822	12823	12824	12825	12826	12827	12828	12829	12830	12831	12832	12833	12834	12835	12836	12837	12838	12839	12840	12841
-56	13002	13003	13004	13005	13006	13007	13008	13009	13010	13011	13012	13013	13014	13015	13016	13017	13018	13019	13020	13021
-58	13182	13183	13184	13185	13186	13187	13188	13189	13190	13191	13192	13193	13194	13195	13196	13197	13198	13199	13200	13201
-60	13362	13363	13364	13365	13356	13367	13368	13369	13370	13371	13372	13373	13374	13375	13376	13377	13378	13379	13380	13381
			546/543					547/542					548/541					549/540		
-62	13542	13543	13544	13545	13546	13547	13548	13549	13550	13551	13552	13553	13554	13555	13555	13557	13558	13559	13560	13561
-64	13722	13723	13724	13725	13725	13727	13728	13729	13730	13731	13732	13733	13734	13735	13736	13737	13738	13739	13740	13741
-66	13902	13903	13904	13905	13905	13907	13908	13909	13910	13911	13912	13913	13914	13915	13916	13917	13918	13919	13920	13921
-68	14082	14083	14084*	14085*	14086*	14087*	14088*	14089*	14090	14091*	14092.	14093.	14094*	14095*	14096*	14097*	14098.	14099*	14100*	14101*
-70	14262.	14263.	14264.	14265.	14266.	14267.	14268.	14269.	14270.	14271.	14272.	14273.	14274.	14275.	14276.	14277.	14278.	14279.	14280.	14281.
			582/579					583/578					584/577					585/576		
-72	14442.	14443.	14444.	14445.	14446.	14447.	14448.	14449.	14450.	14451.	14452.	14453.	14454.	14455.	14456.	14457.	14458.	14459.	14460.	14461.
-74	14622.	14623.	14624.	14625.	14626.	14627.	14628.	14629.	14630.	14631.	14632.	14633.	14634.	14635.	14636.	14637.	14638.	14639.	14640.	14641.
-76	14802.	14803.	14804.	14805.	14806.	14807.	14808.	14809.	14810.	14811.	14812.	14813.	14814.	14815.	14816.	14817.	14818.	14819.	14820.	14821.
-78	14982.	14983.	14984.	14985.	14986.	14987.	14988.	14989.	14990.	14991.	14992.	14993.	14994.	14995.	14996.	14997.	14998.	14999.	15000.	15001.
-80	15162.	15163.	15164.	15165.	15166.	15167.	15168.	15169.	15170.	15171.	15172.	15173.	15174.	15175.	15176.	15177.	15178.	15179.	15180.	15181.
			618/615					619/614					620/613					621/612		
-82	15342.	15343.	15344.	15345.	15346.	15347.	15348.	15349.	15350.	15351.	15352.	15353.	15354.	15355.	15356.	15357.	15358.	15359.	15360.	15361.
-84	15522.	15523.	15524.	15525.	15526.	15527.	15528.	15529.	15530.	15531.	15532.	15533.	15534.	15535.	15536.	15537.	15538.	15539.	15540.	15541.
-86	15702.	15703.	15704.	15705.	15705.	15707.	15708.	15709.	15710.	15711.	15712.	15713.	15714.	15715.	15716.	15717.	15718.	15719.	15720.	15721.
-88	15882.	15883.	15884.	15885.	15885.	15887.	15888.	15889.	15890.	15891.	15892.	15893.	15894.	15895.	15896.	15897.	15898.	15899.	15900.	15901.
-90	16062.	16063.	16064.	16065.	16056.	16067.	16068.	16069.	16070.	16071.	16072.	16073.	16074.	16075.	16076.	16077.	16078.	16079.	16080.	16081.

AUSTRALIA

INDIAN OCEAN

ANTARCTICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.OIC. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 13 OF 18

PACIFIC OCEAN

LAT \ LONG->	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158
	BOX10/450=334/323							335/322					336/321					337/320		
-2	8162	8163	8164	8165	8166	8167	8168*	8169	8170	8171	8172	8173	8174	8175	8176	8177	8178	8179	8180	8181
-4	8342	8343	8344	8345	8346	8347	8348	8349	8350*	8351*	8352*	8353	8354	8355	8356	8357	8358	8359	8360	8361
-6	8522	8523	8524	8525	8526	8527	8528	8529	8530	8531*	8532.	8533.	8534*	8535	8536	8537	8538	8539	8540	8541
-8	8702	8703	8704	8705	8706	8707	8708	8709	8710	8711*	8712*	8713*	8714*	8715*	8716	8717	8718	8719	8720	8721
-10	8882	8883	8884	8885	8886	8887	8888	8889	8890	8891	8892	8893	8894	8895*	8896	8897	8898	8899	8900	8901
			370/359					371/358					372/357					373/356		
-12	9062	9063	9064	9065	9066	9067	9068	9069	9070	9071	9072	9073	9074	9075	9076	9077	9078	9079	9080	9081
-14	9242	9243	9244	9245	9246	9247*	9248*	9249*	9250	9251	9252	9253*	9254	9255	9256	9257	9258	9259	9260	9261
-16	9422	9423	9424	9425*	9426	9427*	9428.	9429*	9430	9431	9432	9433*	9434*	9435	9436	9437	9438	9439	9440	9441
-18	9602	9603	9604*	9605.	9606.	9607.	9608.	9609.	9610*	9611*	9612*	9613.	9614*	9615	9616	9617	9618	9619	9620	9621
-20	9782	9783*	9784.	9785.	9786.	9787.	9788.	9789.	9790.	9791.	9792.	9793.	9794*	9795	9796	9797	9798	9799	9800	9801
			406/395					407/394					408/393					409/392		
-22	9962.	9963.	9964.	9965.	9966.	9967.	9968.	9969.	9970.	9971.	9972.	9973.	9974.	9975.	9976*	9977	9978	9979	9980	9981
-24	10142.	10143.	10144.	10145.	10146.	10147.	10148.	10149.	10150.	10151.	10152.	10153.	10154.	10155.	10156*	10157	10158	10159	10160	10161
-26	10322.	10323.	10324.	10325.	10326.	10327.	10328.	10329.	10330.	10331.	10332.	10333.	10334.	10335.	10336.	10337*	10338	10339	10340	10341
-28	10502.	10503.	10504.	10505.	10506.	10507.	10508.	10509.	10510.	10511.	10512.	10513.	10514.	10515.	10516.	10517.	10518*	10519	10520	10521
-30	10682.	10683.	10684.	10685.	10686.	10687.	10688.	10689.	10690.	10691.	10692.	10693.	10694.	10695.	10696.	10697.	10698*	10699	10700	10701
			442/431					443/430					444/429					445/428		
-32	10862.	10863.	10864.	10865.	10866*	10867*	10868*	10869.	10870.	10871.	10872.	10873.	10874.	10875.	10876.	10877.	10878	10879	10880	10881
-34	11042*	11043*	11044	11045	11046	11047	11048	11049*	11050*	11051*	11052.	11053.	11054.	11055.	11056.	11057*	11058	11059	11060	11061
-36	11222	11223	11224	11225	11226	11227	11228	11229	11230	11231*	11232.	11233.	11234.	11235.	11236.	11237	11238	11239	11240	11241
-38	11402	11403	11404	11405	11406	11407	11408	11409	11410	11411	11412*	11413.	11414*	11415*	11416*	11417	11418	11419	11420	11421
-40	11582	11583	11584	11585	11586	11587	11588	11589	11590	11591	11592	11593	11594	11595	11596	11597	11598	11599	11600	11601
			478/467					479/466					480/465					481/464		
-42	11762	11763	11764	11765	11766	11767	11768	11769	11770	11771	11772	11773	11774	11775	11776	11777	11778	11779	11780	11781
-44	11942	11943	11944	11945	11946	11947	11948	11949	11950	11951	11952	11953	11954	11955*	11956	11957	11958	11959	11960	11961
-46	12122	12123	12124	12125	12126	12127	12128	12129	12130	12131	12132	12133	12134	12135	12136	12137	12138	12139	12140	12141
-48	12302	12303	12304	12305	12306	12307	12308	12309	12310	12311	12312	12313	12314	12315	12316	12317	12318	12319	12320	12321
-50	12482	12483	12484	12485	12486	12487	12488	12489	12490	12491	12492	12493	12494	12495	12496	12497	12498	12499	12500	12501
			514/503					515/502					516/501					517/500		
-52	12662	12663	12664	12665	12666	12667	12668	12669	12670	12671	12672	12673	12674	12675	12676	12677	12678	12679	12680	12681
-54	12842	12843	12844	12845	12846	12847	12848	12849	12850	12851	12852	12853	12854	12855	12856	12857	12858	12859	12860	12861
-56	13022	13023	13024	13025	13026	13027	13028	13029	13030	13031	13032	13033	13034	13035	13036	13037	13038	13039	13040	13041
-58	13202	13203	13204	13205	13206	13207	13208	13209	13210	13211	13212	13213	13214	13215	13216	13217	13218	13219	13220	13221
-60	13382	13383	13384	13385	13386	13387	13388	13389	13390	13391	13392	13393	13394	13395	13396	13397	13398	13399	13400	13401
			550/539					551/538					552/537					553/536		
-62	13562	13563	13564	13565	13566	13567	13568	13569	13570	13571	13572	13573	13574	13575	13576	13577	13578	13579	13580	13581
-64	13742	13743	13744	13745	13746	13747	13748	13749	13750	13751	13752	13753	13754	13755	13756	13757	13758	13759	13760	13761
-66	13922	13923	13924	13925	13926	13927	13928	13929	13930	13931	13932	13933	13934	13935	13936	13937	13938	13939	13940	13941
-68	14102*	14103*	14104*	14105*	14106*	14107*	14108*	14109*	14110*	14111*	14112*	14113*	14114	14115	14116	14117	14118	14119	14120	14121
-70	14282.	14283.	14284.	14285.	14286.	14287.	14288.	14289.	14290.	14291.	14292.	14293.	14294.	14295*	14296*	14297*	14298*	14299	14300	14301
			586/575					587/574					588/573					589/572		
-72	14462.	14463.	14464.	14465.	14466.	14467.	14468.	14469.	14470.	14471.	14472.	14473.	14474.	14475.	14476.	14477.	14478.	14479.	14480.	14481.
-74	14642.	14643.	14644.	14645.	14646.	14647.	14648.	14649.	14650.	14651.	14652.	14653.	14654.	14655.	14656.	14657.	14658.	14659.	14660.	14661.
-76	14822.	14823.	14824.	14825.	14826.	14827.	14828.	14829.	14830.	14831.	14832.	14833.	14834.	14835.	14836.	14837.	14838.	14839.	14840.	14841.
-78	15002.	15003.	15004.	15005.	15006.	15007.	15008.	15009.	15010.	15011.	15012.	15013.	15014.	15015.	15016.	15017.	15018.	15019.	15020.	15021.
-80	15182.	15183.	15184.	15185.	15186.	15187.	15188.	15189.	15190.	15191.	15192.	15193.	15194.	15195.	15196.	15197.	15198.	15199.	15200.	15201.
			622/611					623/610					624/609					625/608		
-82	15362.	15363.	15364.	15365.	15366.	15367.	15368.	15369.	15370.	15371.	15372.	15373.	15374.	15375.	15376.	15377.	15378.	15379.	15380.	15381.
-84	15542.	15543.	15544.	15545.	15546.	15547.	15548.	15549.	15550.	15551.	15552.	15553.	15554.	15555.	15556.	15557.	15558.	15559.	15560.	15561.
-86	15722.	15723.	15724.	15725.	15726.	15727.	15728.	15729.	15730.	15731.	15732.	15733.	15734.	15735.	15736.	15737.	15738.	15739.	15740.	15741.
-88	15902.	15903.	15904.	15905.	15906.	15907.	15908.	15909.	15910.	15911.	15912.	15913.	15914.	15915.	15916.	15917.	15918.	15919.	15920.	15921.
-90	16082.	16083.	16084.	16085.	16086.	16087.	16088.	16089.	16090.	16091.	16092.	16093.	16094.	16095.	16096.	16097.	16098.	16099.	16100.	16101.

AUSTRALIA

ANTARCTICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 14 OF 18

PACIFIC OCEAN / ANTARCTICA

LAT LONG->	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198
BOX10/MSQ			338/319					339/318					340/317					341/316		
-2	8182	8183	8184	8185	8186	8187	8188	8189	8190	8191	8192	8193	8194	8195	8196	8197	8198	8199	8200	8201
-4	8362	8363	8364	8365	8366	8367	8368	8369	8370	8371	8372	8373	8374	8375	8376	8377	8378	8379	8380	8381
-6	8542	8543	8544	8545	8546	8547	8548	8549	8550	8551	8552	8553	8554	8555	8556	8557	8558	8559	8560	8561
-8	8722	8723	8724	8725	8726	8727	8728	8729	8730	8731	8732	8733	8734	8735	8736	8737	8738	8739	8740	8741
-10	8902	8903	8904	8905	8906	8907	8908	8909	8910	8911	8912	8913	8914	8915	8916	8917	8918	8919	8920	8921
			374/355					375/354					376/353					377/352		
-12	9082	9083	9084	9085	9086	9087	9088	9089	9090	9091	9092	9093	9094	9095	9096	9097	9098	9099	9100	9101
-14	9262	9263	9264	9265	9266	9267	9268	9269	9270	9271	9272	9273	9274	9275	9276	9277	9278	9279	9280	9281
-16	9442	9443	9444	9445	9446	9447	9448	9449	9450	9451	9452	9453	9454	9455	9456	9457	9458	9459	9460	9461
-18	9622	9623	9624	9625	9626	9627	9628	9629	9630	9631	9632	9633	9634	9635	9636	9637	9638	9639	9640	9641
-20	9802	9803	9804	9805	9806	9807	9808	9809	9810	9811	9812	9813	9814	9815	9816	9817	9818	9819	9820	9821
			410/391					411/390					412/389					413/388		
-22	9982	9983	9984	9985	9986	9987	9988	9989	9990	9991	9992	9993	9994	9995	9996	9997	9998	9999	10000	10001
-24	10162	10163	10164	10165	10166	10167	10168	10169	10170	10171	10172	10173	10174	10175	10176	10177	10178	10179	10180	10181
-26	10342	10343	10344	10345	10346	10347	10348	10349	10350	10351	10352	10353	10354	10355	10356	10357	10358	10359	10360	10361
-28	10522	10523	10524	10525	10526	10527	10528	10529	10530	10531	10532	10533	10534	10535	10536	10537	10538	10539	10540	10541
-30	10702	10703	10704	10705	10706	10707	10708	10709	10710	10711	10712	10713	10714	10715	10716	10717	10718	10719	10720	10721
			446/427					447/426					448/425					449/424		
-32	10882	10883	10884	10885	10886	10887	10888	10889	10890	10891	10892	10893	10894	10895	10896	10897	10898	10899	10900	10901
-34	11062	11063	11064	11065	11066	11067	11068	11069	11070	11071	11072	11073	11074	11075	11076	11077	11078	11079	11080	11081
-36	11242	11243	11244	11245	11246	11247	11248	11249	11250	11251	11252	11253	11254	11255	11256	11257	11258	11259	11260	11261
-38	11422	11423	11424	11425	11426	11427	11428	11429	11430	11431	11432	11433	11434	11435	11436	11437	11438	11439	11440	11441
-40	11602	11603	11604	11605	11606	11607	11608	11609*	11610*	11611	11612	11613	11614	11615	11616	11617	11618	11619	11620	11621
			482/463					483/462					484/461					485/460		
-42	11782	11783	11784	11785	11786	11787	11788	11789	11790	11791	11792	11793	11794	11795	11796	11797	11798	11799	11800	11801
-44	11962	11963	11964	11965	11966	11967	11968*	11969	11970	11971	11972	11973	11974	11975	11976	11977	11978	11979	11980	11981
-46	12142	12143	12144	12145*	12146	12147*	12148	12149	12150	12151	12152	12153	12154	12155	12156	12157	12158	12159	12160	12161
-48	12322	12323	12324	12325	12326	12327	12328	12329	12330	12331	12332	12333	12334	12335	12336	12337	12338	12339	12340	12341
-50	12502	12503	12504	12505	12506	12507	12508	12509	12510	12511	12512	12513	12514	12515	12516	12517	12518	12519	12520	12521
			518/499					519/498					520/497					521/496		
-52	12682	12683	12684	12685	12686	12687	12688	12689	12690	12691	12692	12693	12694	12695	12696	12697	12698	12699	12700	12701
-54	12862	12863	12864	12865	12866	12867	12868	12869	12870	12871	12872	12873	12874	12875	12876	12877	12878	12879	12880	12881
-56	13042	13043	13044	13045	13046	13047	13048	13049	13050	13051	13052	13053	13054	13055	13056	13057	13058	13059	13060	13061
-58	13222	13223	13224	13225	13226	13227	13228	13229	13230	13231	13232	13233	13234	13235	13236	13237	13238	13239	13240	13241
-60	13402	13403	13404	13405	13406	13407	13408	13409	13410	13411	13412	13413	13414	13415	13416	13417	13418	13419	13420	13421
			554/535					555/534					556/533					557/532		
-62	13582	13583	13584	13585	13586	13587	13588	13589	13590	13591	13592	13593	13594	13595	13596	13597	13598	13599	13600	13601
-64	13762	13763	13764	13765	13766	13767	13768	13769	13770	13771	13772	13773	13774	13775	13776	13777	13778	13779	13780	13781
-66	13942	13943	13944	13945	13946	13947	13948	13949	13950	13951	13952	13953	13954	13955	13956	13957	13958	13959	13960	13961
-68	14122	14123	14124	14125	14126	14127	14128	14129	14130	14131	14132	14133	14134	14135	14136	14137	14138	14139	14140	14141
-70	14302	14303	14304	14305	14306	14307	14308	14309	14310	14311	14312	14313	14314	14315	14316	14317	14318	14319	14320	14321
			590/571					591/570					592/569					593/568		
-72	14482*	14483*	14484*	14485*	14486	14487	14488	14489	14490	14491	14492	14493	14494	14495	14496	14497	14498	14499	14500	14501
-74	14662.	14663.	14664.	14665.	14666*	14667	14668	14669	14670	14671	14672	14673	14674	14675	14676	14677	14678	14679	14680	14681
-76	14842.	14843*	14844	14845	14846	14847	14848	14849	14850	14851	14852	14853	14854	14855	14856	14857	14858	14859	14860	14861
-78	15022.	15023*	15024	15025	15026	15027	15028	15029	15030	15031	15032	15033	15034	15035	15036	15037	15038	15039	15040	15041
-80	15202.	15203.	15204.	15205.	15206.	15207.	15208.	15209.	15210*	15211*	15212*	15213*	15214*	15215*	15216*	15217*	15218*	15219*	15220*	15221*
			626/607					627/606					628/605					629/604		
-82	15382.	15383.	15384.	15385.	15386.	15387.	15388.	15389.	15390.	15391.	15392.	15393.	15394.	15395.	15396.	15397.	15398.	15399.	15400.	15401.
-84	15562.	15563.	15564.	15565.	15566.	15567.	15568.	15569.	15570.	15571.	15572.	15573.	15574.	15575.	15576.	15577.	15578.	15579.	15580.	15581.
-86	15742.	15743.	15744.	15745.	15746.	15747.	15748.	15749.	15750.	15751.	15752.	15753.	15754.	15755.	15756.	15757.	15758.	15759.	15760.	15761.
-88	15922.	15923.	15924.	15925.	15926.	15927.	15928.	15929.	15930.	15931.	15932.	15933.	15934.	15935.	15936.	15937.	15938.	15939.	15940.	15941.
-90	16102.	16103.	16104.	16105.	16106.	16107.	16108.	16109.	16110.	16111.	16112.	16113.	16114.	16115.	16116.	16117.	16118.	16119.	16120.	16121.

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 15 OF 18

PACIFIC OCEAN / ANTARCTICA

LAT \ LONG->	200	202	204	206	208	210	212	214	216	218	220	222	224	226	228	230	232	234	236	238
			BOX10/450=342/315					343/314					344/313					345/312		
-2	8202	8203	8204	8205	8206	8207	8208	8209	8210	8211	8212	8213	8214	8215	8216	8217	8218	8219	8220	8221
-4	8382	8383	8384	8385	8386	8387	8388	8389	8390	8391	8392	8393	8394	8395	8396	8397	8398	8399	8430	8401
-6	8562	8563	8564	8565	8566	8567	8568	8569	8570	8571	8572	8573	8574	8575	8576	8577	8578	8579	8580	8581
-8	8742	8743	8744	8745	8746	8747	8748	8749	8750	8751	8752	8753	8754	8755	8756	8757	8758	8759	8760	8761
-10	8922	8923	8924	8925	8926	8927	8928	8929	8930	8931	8932	8933	8934	8935	8936	8937	8938	8939	8940	8941
			378/351					379/350					380/349					381/348		
-12	9102	9103	9104	9105	9106	9107	9108	9109	9110	9111	9112	9113	9114	9115	9116	9117	9118	9119	9120	9121
-14	9282	9283	9284	9285	9286	9287	9288	9289	9290	9291	9292	9293	9294	9295	9296	9297	9298	9299	9300	9301
-16	9462	9463	9464	9465	9466	9467	9468	9469	9470	9471	9472	9473	9474	9475	9476	9477	9478	9479	9480	9481
-18	9642	9643	9644	9645	9646	9647	9648	9649	9650	9651	9652	9653	9654	9655	9656	9657	9658	9659	9660	9661
-20	9822	9823	9824	9825	9826	9827	9828	9829	9830	9831	9832	9833	9834	9835	9836	9837	9838	9839	9840	9841
			414/387					415/386					416/385					417/384		
-22	10002	10003	10004	10005	10006	10007	10008	10009	10010	10011	10012	10013	10014	10015	10016	10017	10018	10019	10020	10021
-24	10182	10183	10184	10185	10186	10187	10188	10189	10190	10191	10192	10193	10194	10195	10196	10197	10198	10199	10200	10201
-26	10362	10363	10364	10365	10366	10367	10368	10369	10370	10371	10372	10373	10374	10375	10376	10377	10378	10379	10380	10381
-28	10542	10543	10544	10545	10546	10547	10548	10549	10550	10551	10552	10553	10554	10555	10556	10557	10558	10559	10560	10561
-30	10722	10723	10724	10725	10726	10727	10728	10729	10730	10731	10732	10733	10734	10735	10736	10737	10738	10739	10740	10741
			450/423					451/422					452/421					453/420		
-32	10902	10903	10904	10905	10906	10907	10908	10909	10910	10911	10912	10913	10914	10915	10916	10917	10918	10919	10920	10921
-34	11082	11083	11084	11085	11086	11087	11088	11089	11090	11091	11092	11093	11094	11095	11096	11097	11098	11099	11100	11101
-36	11262	11263	11264	11265	11266	11267	11268	11269	11270	11271	11272	11273	11274	11275	11276	11277	11278	11279	11280	11281
-38	11442	11443	11444	11445	11446	11447	11448	11449	11450	11451	11452	11453	11454	11455	11456	11457	11458	11459	11460	11461
-40	11622	11623	11624	11625	11626	11627	11628	11629	11630	11631	11632	11633	11634	11635	11636	11637	11638	11639	11640	11641
			486/459					487/458					488/457					489/456		
-42	11802	11803	11804	11805	11806	11807	11808	11809	11810	11811	11812	11813	11814	11815	11816	11817	11818	11819	11820	11821
-44	11982	11983	11984	11985	11986	11987	11988	11989	11990	11991	11992	11993	11994	11995	11996	11997	11998	11999	12000	12001
-46	12162	12163	12164	12165	12166	12167	12168	12169	12170	12171	12172	12173	12174	12175	12176	12177	12178	12179	12180	12181
-48	12342	12343	12344	12345	12346	12347	12348	12349	12350	12351	12352	12353	12354	12355	12356	12357	12358	12359	12360	12361
-50	12522	12523	12524	12525	12526	12527	12528	12529	12530	12531	12532	12533	12534	12535	12536	12537	12538	12539	12540	12541
			522/495					523/494					524/493					525/492		
-52	12702	12703	12704	12705	12706	12707	12708	12709	12710	12711	12712	12713	12714	12715	12716	12717	12718	12719	12720	12721
-54	12882	12883	12884	12885	12886	12887	12888	12889	12890	12891	12892	12893	12894	12895	12896	12897	12898	12899	12900	12901
-56	13062	13063	13064	13065	13066	13067	13068	13069	13070	13071	13072	13073	13074	13075	13076	13077	13078	13079	13080	13081
-58	13242	13243	13244	13245	13246	13247	13248	13249	13250	13251	13252	13253	13254	13255	13256	13257	13258	13259	13260	13261
-60	13422	13423	13424	13425	13426	13427	13428	13429	13430	13431	13432	13433	13434	13435	13436	13437	13438	13439	13440	13441
			558/531					559/530					560/529					561/528		
-62	13602	13603	13604	13605	13606	13607	13608	13609	13610	13611	13612	13613	13614	13615	13616	13617	13618	13619	13620	13621
-64	13782	13783	13784	13785	13786	13787	13788	13789	13790	13791	13792	13793	13794	13795	13796	13797	13798	13799	13800	13801
-66	13962	13963	13964	13965	13966	13967	13968	13969	13970	13971	13972	13973	13974	13975	13976	13977	13978	13979	13980	13981
-68	14142	14143	14144	14145	14146	14147	14148	14149	14150	14151	14152	14153	14154	14155	14156	14157	14158	14159	14160	14161
-70	14322	14323	14324	14325	14326	14327	14328	14329	14330	14331	14332	14333	14334	14335	14336	14337	14338	14339	14340	14341
			594/567					595/566					596/565					597/564		
-72	14502	14503	14504	14505	14506	14507	14508	14509	14510	14511	14512	14513	14514	14515	14516	14517	14518	14519	14520	14521
-74	14682	14683	14684	14685	14686	14687	14688	14689	14690	14691	14692	14693	14694	14695	14696	14697	14698	14699	14700	14701
-76	14862	14863	14864	14865	14866	14867	14868	14869	14870	14871	14872*	14873*	14874*	14875*	14876*	14877*	14878*	14879.	14880.	14881.
-78	15042	15043	15044	15045	15046*	15047*	15048*	15049*	15050.	15051.	15052.	15053.	15054.	15055.	15056.	15057.	15058.	15059.	15060.	15061.
-80	15222.	15223.	15224.	15225.	15226.	15227.	15228.	15229.	15230.	15231.	15232.	15233.	15234.	15235.	15236.	15237.	15238.	15239.	15240.	15241.
			630/603					631/602					632/601					633/600		
-82	15402.	15403.	15404.	15405.	15406.	15407.	15408.	15409.	15410.	15411.	15412.	15413.	15414.	15415.	15416.	15417.	15418.	15419.	15420.	15421.
-84	15582.	15583.	15584.	15585.	15586.	15587.	15588.	15589.	15590.	15591.	15592.	15593.	15594.	15595.	15596.	15597.	15598.	15599.	15600.	15601.
-86	15762.	15763.	15764.	15765.	15766.	15767.	15768.	15769.	15770.	15771.	15772.	15773.	15774.	15775.	15776.	15777.	15778.	15779.	15780.	15781.
-88	15942.	15943.	15944.	15945.	15946.	15947.	15948.	15949.	15950.	15951.	15952.	15953.	15954.	15955.	15956.	15957.	15958.	15959.	15960.	15961.
-90	16122.	16123.	16124.	16125.	16126.	16127.	16128.	16129.	16130.	16131.	16132.	16133.	16134.	16135.	16136.	16137.	16138.	16139.	16140.	16141.

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 16 OF 18

PACIFIC OCEAN / ANTARCTICA

LAT \ LONG->	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278
BOX10/MSQ=	346/311					347/310					348/309					349/308				
-2	8222	8223	8224	8225	8226	8227	8228	8229	8230	8231	8232	8233	8234	8235	8236	8237	8238	8239	8240	8241
-4	8402	8403	8404	8405	8406	8407	8408	8409	8410	8411	8412	8413	8414	8415	8416	8417	8418	8419	8420	8421
-6	8582	8583	8584	8585	8586	8587	8588	8589	8590	8591	8592	8593	8594	8595	8596	8597	8598	8599	8600	8601*
-8	8762	8763	8764	8765	8766	8767	8768	8769	8770	8771	8772	8773	8774	8775	8776	8777	8778	8779	8780	8781
-10	8942	8943	8944	8945	8946	8947	8948	8949	8950	8951	8952	8953	8954	8955	8956	8957	8958	8959	8960	8961
	382/347					383/346					384/345					385/344				
-12	9122	9123	9124	9125	9126	9127	9128	9129	9130	9131	9132	9133	9134	9135	9136	9137	9138	9139	9140	9141
-14	9302	9303	9304	9305	9306	9307	9308	9309	9310	9311	9312	9313	9314	9315	9316	9317	9318	9319	9320	9321
-16	9482	9483	9484	9485	9486	9487	9488	9489	9490	9491	9492	9493	9494	9495	9496	9497	9498	9499	9500	9501
-18	9662	9663	9664	9665	9666	9667	9668	9669	9670	9671	9672	9673	9674	9675	9676	9677	9678	9679	9680	9681
-20	9842	9843	9844	9845	9846	9847	9848	9849	9850	9851	9852	9853	9854	9855	9856	9857	9858	9859	9860	9861
	418/383					419/382					420/381					421/380				
-22	10022	10023	10024	10025	10026	10027	10028	10029	10030	10031	10032	10033	10034	10035	10036	10037	10038	10039	10040	10041
-24	10202	10203	10204	10205	10206	10207	10208	10209	10210	10211	10212	10213	10214	10215	10216	10217	10218	10219	10220	10221
-26	10382	10383	10384	10385	10386	10387	10388	10389	10390	10391	10392	10393	10394	10395	10396	10397	10398	10399	10400	10401
-28	10562	10563	10564	10565	10566	10567	10568	10569	10570	10571	10572	10573	10574	10575	10576	10577	10578	10579	10580	10581
-30	10742	10743	10744	10745	10746	10747	10748	10749	10750	10751	10752	10753	10754	10755	10756	10757	10758	10759	10760	10761
	454/419					455/418					456/417					457/416				
-32	10922	10923	10924	10925	10926	10927	10928	10929	10930	10931	10932	10933	10934	10935	10936	10937	10938	10939	10940	10941
-34	11102	11103	11104	11105	11106	11107	11108	11109	11110	11111	11112	11113	11114	11115	11116	11117	11118	11119	11120	11121
-36	11282	11283	11284	11285	11286	11287	11288	11289	11290	11291	11292	11293	11294	11295	11296	11297	11298	11299	11300	11301
-38	11462	11463	11464	11465	11466	11467	11468	11469	11470	11471	11472	11473	11474	11475	11476	11477	11478	11479	11480	11481
-40	11642	11643	11644	11645	11646	11647	11648	11649	11650	11651	11652	11653	11654	11655	11656	11657	11658	11659	11660	11661
	490/455					491/454					492/453					493/452				
-42	11822	11823	11824	11825	11826	11827	11828	11829	11830	11831	11832	11833	11834	11835	11836	11837	11838	11839	11840	11841
-44	12002	12003	12004	12005	12006	12007	12008	12009	12010	12011	12012	12013	12014	12015	12016	12017	12018	12019	12020	12021
-46	12182	12183	12184	12185	12186	12187	12188	12189	12190	12191	12192	12193	12194	12195	12196	12197	12198	12199	12200	12201
-48	12362	12363	12364	12365	12366	12367	12368	12369	12370	12371	12372	12373	12374	12375	12376	12377	12378	12379	12380	12381
-50	12542	12543	12544	12545	12546	12547	12548	12549	12550	12551	12552	12553	12554	12555	12556	12557	12558	12559	12560	12561
	526/491					527/490					528/489					529/488				
-52	12722	12723	12724	12725	12726	12727	12728	12729	12730	12731	12732	12733	12734	12735	12736	12737	12738	12739	12740	12741
-54	12902	12903	12904	12905	12906	12907	12908	12909	12910	12911	12912	12913	12914	12915	12916	12917	12918	12919	12920	12921
-56	13082	13083	13084	13085	13086	13087	13088	13089	13090	13091	13092	13093	13094	13095	13096	13097	13098	13099	13100	13101
-58	13262	13263	13264	13265	13266	13267	13268	13269	13270	13271	13272	13273	13274	13275	13276	13277	13278	13279	13280	13281
-60	13442	13443	13444	13445	13446	13447	13448	13449	13450	13451	13452	13453	13454	13455	13456	13457	13458	13459	13460	13461
	562/527					563/526					564/525					565/524				
-62	13622	13623	13624	13625	13626	13627	13628	13629	13630	13631	13632	13633	13634	13635	13636	13637	13638	13639	13640	13641
-64	13802	13803	13804	13805	13806	13807	13808	13809	13810	13811	13812	13813	13814	13815	13816	13817	13818	13819	13820	13821
-66	13982	13983	13984	13985	13986	13987	13988	13989	13990	13991	13992	13993	13994	13995	13996	13997	13998	13999	14000	14001
-68	14162	14163	14164	14165	14166	14167	14168	14169	14170	14171	14172	14173	14174	14175	14176	14177	14178	14179	14180	14181
-70	14342	14343	14344	14345	14346	14347	14348	14349	14350	14351	14352	14353	14354	14355	14356	14357	14358	14359	14360	14361
	598/563					599/562					600/561					601/560				
-72	14522	14523	14524	14525	14526	14527	14528	14529	14530	14531	14532	14533	14534	14535	14536	14537	14538	14539	14540	14541
-74	14702	14703	14704	14705	14706	14707	14708	14709	14710	14711	14712*	14713*	14714*	14715*	14716*	14717*	14718	14719*	14720*	14721
-76	14882*	14883*	14884*	14885*	14886*	14887*	14888*	14889*	14890*	14891*	14892.	14893.	14894.	14895.	14896.	14897.	14898.	14899.	14900.	14901.
-78	15062.	15063.	15064.	15065.	15066.	15067.	15068.	15069.	15070.	15071.	15072.	15073.	15074.	15075.	15076.	15077.	15078.	15079.	15080.	15081.
-80	15242.	15243.	15244.	15245.	15246.	15247.	15248.	15249.	15250.	15251.	15252.	15253.	15254.	15255.	15256.	15257.	15258.	15259.	15260.	15261.
	634/599					635/598					636/597					637/596				
-82	15422.	15423.	15424.	15425.	15426.	15427.	15428.	15429.	15430.	15431.	15432.	15433.	15434.	15435.	15436.	15437.	15438.	15439.	15440.	15441.
-84	15602.	15603.	15604.	15605.	15606.	15607.	15608.	15609.	15610.	15611.	15612.	15613.	15614.	15615.	15616.	15617.	15618.	15619.	15620.	15621.
-86	15782.	15783.	15784.	15785.	15786.	15787.	15788.	15789.	15790.	15791.	15792.	15793.	15794.	15795.	15796.	15797.	15798.	15799.	15800.	15801.
-88	15962.	15963.	15964.	15965.	15966.	15967.	15968.	15969.	15970.	15971.	15972.	15973.	15974.	15975.	15976.	15977.	15978.	15979.	15980.	15981.
-90	16142.	16143.	16144.	16145.	16146.	16147.	16148.	16149.	16150.	16151.	16152.	16153.	16154.	16155.	16156.	16157.	16158.	16159.	16160.	16161.

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 17 OF 18

S. AMERICA — ATLANTIC OCEAN — PACIFIC OCEAN — ANTARCTICA

LAT \ LONG->	280	282	284	286	288	290	292	294	296	298	300	302	304	306	308	310	312	314	316	318
BOX10/MSQ=	350/307					351/306					352/305					353/304				
-2	8242.	8243.	8244.	8245.	8246.	8247.	8248.	8249.	8250.	8251.	8252.	8253*	8254*	8255*	8256	8257	8258*	8259	8260	8261
-4	8422*	8423.	8424.	8425.	8426.	8427.	8428.	8429.	8430.	8431.	8432	8433*	8434*	8435.	8436.	8437*	8438.	8439*	8440*	8441*
-6	8602.	8603.	8604.	8605.	8606.	8607.	8608.	8609.	8610.	8611.	8612.	8613.	8614.	8615.	8616.	8617.	8618.	8619.	8620.	8621.
-8	8782*	8783.	8784.	8785.	8786.	8787.	8788.	8789.	8790.	8791.	8792.	8793.	8794.	8795.	8796.	8797.	8798.	8799.	8800.	8801.
-10	8962	8963.	8964.	8965.	8966.	8967.	8968.	8969.	8970.	8971.	8972.	8973.	8974.	8975.	8976.	8977.	8978.	8979.	8980.	8981.
	386/343					387/342					388/341					389/340				
-12	9142	9143*	9144.	9145.	9146.	9147.	9148.	9149.	9150.	9151.	9152.	9153.	9154.	9155.	9156.	9157.	9158.	9159.	9160.	9161.
-14	9322	9323	9324.	9325.	9326.	9327.	9328.	9329.	9330.	9331.	9332.	9333.	9334.	9335.	9336.	9337.	9338.	9339.	9340.	9341.
-16	9502	9503	9504*	9505*	9506.	9507.	9508.	9509.	9510.	9511.	9512.	9513.	9514.	9515.	9516.	9517.	9518.	9519.	9520.	9521.
-18	9682	9683	9684	9685	9686*	9687.	9688.	9689.	9690.	9691.	9692.	9693.	9694.	9695.	9696.	9697.	9698.	9699.	9700.	9701.
-20	9862	9863	9864	9865	9866	9867.	9868.	9869.	9870.	9871.	9872.	9873.	9874.	9875.	9876.	9877.	9878.	9879.	9880.	9881*
	422/379					423/378					424/377					425/376				
-22	10042	10043	10044	10045	10046	10047.	10048.	10049.	10050.	10051.	10052.	10053.	10054.	10055.	10056.	10057.	10058.	10059.	10060.	10061*
-24	10222	10223	10224	10225	10226	10227.	10228.	10229.	10230.	10231.	10232.	10233.	10234.	10235.	10236.	10237.	10238*	10239*	10240	10241
-26	10402	10403	10404	10405	10406	10407.	10408.	10409.	10410.	10411.	10412.	10413.	10414.	10415.	10416.	10417*	10418	10419	10420	10421
-28	10582	10583	10584	10585	10586	10587.	10588.	10589.	10590.	10591.	10592.	10593.	10594.	10595.	10596.	10597*	10598	10599	10600	10601
-30	10762	10763	10764	10765	10766*	10767.	10768.	10769.	10770.	10771.	10772.	10773.	10774.	10775.	10776*	10777	10778	10779	10780	10781
	458/415					459/414					460/413					461/412				
-32	10942	10943	10944	10945	10946*	10947.	10948.	10949.	10950.	10951.	10952.	10953.	10954.	10955*	10956	10957	10958	10959	10960	10961
-34	11122	11123	11124	11125	11126*	11127.	11128.	11129.	11130.	11131.	11132.	11133.	11134.	11135*	11136	11137	11138	11139	11140	11141
-36	11302	11303	11304	11305	11306*	11307.	11308.	11309.	11310.	11311.	11312*	11313	11314	11315	11316	11317	11318	11319	11320	11321
-38	11482	11483	11484	11485*	11486.	11487.	11488.	11489.	11490.	11491.	11492.	11493	11494	11495	11496	11497	11498	11499	11500	11501
-40	11662	11663	11664	11665*	11666.	11667.	11668.	11669.	11670*	11671	11672	11673	11674	11675	11676	11677	11678	11679	11680	11681
	494/451					495/450					496/449					497/448				
-42	11842	11843	11844	11845*	11846.	11847.	11848.	11849	11850*	11851	11852	11853	11854	11855	11856	11857	11858	11859	11860	11861
-44	12022	12023	12024	12025	12026.	12027.	12028.	12029	12030	12031	12032	12033	12034	12035	12036	12037	12038	12039	12040	12041
-46	12202	12203	12204	12205	12206.	12207.	12208*	12209	12210	12211	12212	12213	12214	12215	12216	12217	12218	12219	12220	12221
-48	12382	12383	12384	12385*	12386.	12387.	12388*	12389	12390	12391	12392	12393	12394	12395	12396	12397	12398	12399	12400	12401
-50	12562	12563	12564	12565*	12566.	12567*	12568	12569	12570	12571	12572	12573	12574	12575	12576	12577	12578	12579	12580	12581
	530/487					531/486					532/485					533/484				
-52	12742	12743	12744	12745	12746.	12747	12748	12749	12750	12751	12752	12753	12754	12755	12756	12757	12758	12759	12760	12761
-54	12922	12923	12924	12925	12926	12927	12928	12929	12930	12931	12932	12933	12934	12935	12936	12937	12938	12939	12940	12941
-56	13102	13103	13104	13105	13106	13107	13108	13109	13110	13111	13112	13113	13114	13115	13116	13117	13118	13119	13120	13121
-58	13282	13283	13284	13285	13286	13287	13288	13289	13290	13291	13292	13293	13294	13295	13296	13297	13298	13299	13300	13301
-60	13462	13463	13464	13465	13466	13467	13468	13469	13470	13471	13472	13473	13474	13475	13476	13477	13478	13479	13480	13481
	566/523					567/522					568/521					569/520				
-62	13642	13643	13644	13645	13646	13647	13648	13649	13650	13651	13652	13653	13654	13655	13656	13657	13658	13659	13660	13661
-64	13822	13823	13824	13825	13826	13827	13828	13829	13830	13831	13832	13833	13834	13835	13836	13837	13838	13839	13840	13841
-66	14002	14003	14004	14005	14006	14007	14008	14009	14010	14011*	14012	14013	14014	14015	14016	14017	14018	14019	14020	14021
-68	14182	14183	14184	14185	14186	14187	14188	14189*	14190	14191*	14192	14193	14194	14195	14196	14197	14198	14199	14200	14201
-70	14362	14363	14364	14365	14366	14367	14368*	14369.	14370.	14371*	14372	14373	14374	14375	14376	14377	14378	14379	14380	14381
	602/559					603/558					604/557					605/556				
-72	14542	14543	14544	14545*	14546.	14547*	14548*	14549.	14550.	14551	14552	14553	14554	14555	14556	14557	14558	14559	14560	14561
-74	14722	14723*	14724	14725	14726*	14727*	14728*	14729.	14730.	14731*	14732	14733	14734	14735	14736	14737	14738	14739	14740	14741
-76	14902.	14903.	14904.	14905.	14906.	14907.	14908.	14909.	14910.	14911	14912	14913	14914	14915	14916	14917	14918	14919	14920	14921
-78	15082.	15083.	15084.	15085.	15086.	15087.	15088.	15089.	15090.	15091.	15092.	15093*	15094*	15095*	15096	15097	15098	15099	15100	15101
-80	15262.	15263.	15264.	15265.	15266.	15267.	15268.	15269.	15270.	15271.	15272.	15273.	15274.	15275.	15276.	15277.	15278*	15279*	15280*	15281*
	638/595					639/594					640/593					641/592				
-82	15442.	15443.	15444.	15445.	15446.	15447.	15448.	15449.	15450.	15451.	15452.	15453.	15454.	15455.	15456.	15457.	15458.	15459.	15460.	15461.
-84	15622.	15623.	15624.	15625.	15626.	15627.	15628.	15629.	15630.	15631.	15632.	15633.	15634.	15635.	15636.	15637.	15638.	15639.	15640.	15641.
-86	15802.	15803.	15804.	15805.	15806.	15807.	15808.	15809.	15810.	15811.	15812.	15813.	15814.	15815.	15816.	15817.	15818.	15819.	15820.	15821.
-88	15982.	15983.	15984.	15985.	15986.	15987.	15988.	15989.	15990.	15991.	15992.	15993.	15994.	15995.	15996.	15997.	15998.	15999.	16000.	16001.
-90	16162.	16163.	16164.	16165.	16166.	16167.	16168.	16169.	16170.	16171.	16172.	16173.	16174.	16175.	16176.	16177.	16178.	16179.	16180.	16181.

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/08. 16.43.47.

Table G2-1 (continued)

TABLE OF BOX2

FOR LAT AND LONG AT SW CORNER OF EACH BOX2 PAGE 18 OF 18

LAT LONG->	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358
I-BOX10/MSQ=		354/303						355/302					356/301					357/300		
-2	8262	8263	8264	8265	8266	8267	8268	8269	8270	8271	8272	8273	8274	8275	8276	8277	8278	8279	8280	8281
-4	8442	8443	8444	8445	8446	8447	8448	8449	8450	8451	8452	8453	8454	8455	8456	8457	8458	8459	8460	8461
-6	8622*	8623*	8624	8625	8626	8627	8628	8629	8630	8631	8632	8633	8634	8635	8636	8637	8638	8639	8640	8641
-8	8802.	8803.	8804*	8805	8806	8807	8808	8809	8810	8811	8812	8813	8814	8815	8816	8817	8818	8819	8820	8821
-10	8982.	8983.	8984	8985	8986	8987	8988	8989	8990	8991	8992	8993	8994	8995	8996	8997	8998	8999	9000	9001
I		390/339						391/338					392/337					393/336		
-12	9162.	9163	9164	9165	9166	9167	9168	9169	9170	9171	9172	9173	9174	9175	9176	9177	9178	9179	9180	9181
-14	9342*	9343	9344	9345	9346	9347	9348	9349	9350	9351	9352	9353	9354	9355	9356	9357	9358	9359	9360	9361
-16	9522	9523	9524	9525	9526	9527	9528	9529	9530	9531	9532	9533	9534	9535	9536	9537	9538	9539	9540	9541
-18	9702	9703	9704	9705	9706	9707	9708	9709	9710	9711	9712	9713	9714	9715	9716	9717	9718	9719	9720	9721
-20	9882	9883	9884	9885	9886	9887	9888	9889	9890	9891	9892	9893	9894	9895	9896	9897	9898	9899	9900	9901
I		426/375						427/374					428/373					429/372		
-22	10062	10063	10064	10065	10066	10067	10068	10069	10070	10071	10072	10073	10074	10075	10076	10077	10078	10079	10080	10081
-24	10242	10243	10244	10245	10246	10247	10248	10249	10250	10251	10252	10253	10254	10255	10256	10257	10258	10259	10260	10261
-26	10422	10423	10424	10425	10426	10427	10428	10429	10430	10431	10432	10433	10434	10435	10436	10437	10438	10439	10440	10441
-28	10602	10603	10604	10605	10606	10607	10608	10609	10610	10611	10612	10613	10614	10615	10616	10617	10618	10619	10620	10621
-30	10782	10783	10784	10785	10786	10787	10788	10789	10790	10791	10792	10793	10794	10795	10796	10797	10798	10799	10800	10801
I		462/411						463/410					464/409					465/408		
-32	10962	10963	10964	10965	10966	10967	10968	10969	10970	10971	10972	10973	10974	10975	10976	10977	10978	10979	10980	10981
-34	11142	11143	11144	11145	11146	11147	11148	11149	11150	11151	11152	11153	11154	11155	11156	11157	11158	11159	11160	11161
-36	11322	11323	11324	11325	11326	11327	11328	11329	11330	11331	11332	11333	11334	11335	11336	11337	11338	11339	11340	11341
-38	11502	11503	11504	11505	11506	11507	11508	11509	11510	11511	11512	11513	11514	11515	11516	11517	11518	11519	11520	11521
-40	11682	11683	11684	11685	11686	11687	11688	11689	11690	11691	11692	11693	11694	11695	11696	11697	11698	11699	11700	11701
I		498/447						499/446					500/445					501/444		
-42	11862	11863	11864	11865	11866	11867	11868	11869	11870	11871	11872	11873	11874	11875	11876	11877	11878	11879	11880	11881
-44	12042	12043	12044	12045	12046	12047	12048	12049	12050	12051	12052	12053	12054	12055	12056	12057	12058	12059	12060	12061
-46	12222	12223	12224	12225	12226	12227	12228	12229	12230	12231	12232	12233	12234	12235	12236	12237	12238	12239	12240	12241
-48	12402	12403	12404	12405	12406	12407	12408	12409	12410	12411	12412	12413	12414	12415	12416	12417	12418	12419	12420	12421
-50	12582	12583	12584	12585	12586	12587	12588	12589	12590	12591	12592	12593	12594	12595	12596	12597	12598	12599	12600	12601
I		534/483						535/482					536/481					537/480		
-52	12762	12763	12764	12765	12766	12767	12768	12769	12770	12771	12772	12773	12774	12775	12776	12777	12778	12779	12780	12781
-54	12942	12943	12944	12945	12946	12947	12948	12949	12950	12951	12952	12953	12954	12955	12956	12957	12958	12959	12960	12961
-56	13122	13123	13124	13125	13126	13127	13128	13129	13130	13131	13132	13133	13134	13135	13136	13137	13138	13139	13140	13141
-58	13302	13303	13304	13305	13306	13307	13308	13309	13310	13311	13312	13313	13314	13315	13316	13317	13318	13319	13320	13321
-60	13482	13483	13484	13485	13486	13487	13488	13489	13490	13491	13492	13493	13494	13495	13496	13497	13498	13499	13500	13501
I		570/519						571/518					572/517					573/516		
-62	13662	13663	13664	13665	13666	13667	13668	13669	13670	13671	13672	13673	13674	13675	13676	13677	13678	13679	13680	13681
-64	13842	13843	13844	13845	13846	13847	13848	13849	13850	13851	13852	13853	13854	13855	13856	13857	13858	13859	13860	13861
-66	14022	14023	14024	14025	14026	14027	14028	14029	14030	14031	14032	14033	14034	14035	14036	14037	14038	14039	14040	14041
-68	14202	14203	14204	14205	14206	14207	14208	14209	14210	14211	14212	14213	14214	14215	14216	14217	14218	14219	14220	14221
-70	14382	14383	14384	14385	14386	14387	14388	14389	14390	14391	14392	14393	14394	14395	14396	14397	14398	14399	14400	14401
I		606/555						607/554					608/553					609/552		
-72	14562	14563	14564	14565	14566	14567	14568	14569	14570	14571	14572	14573	14574	14575	14576	14577*	14578*	14579*	14580*	14581*
-74	14742	14743	14744	14745	14746	14747	14748	14749	14750	14751	14752	14753*	14754*	14755*	14756.	14757.	14758.	14759.	14760.	14761.
-76	14922	14923	14924	14925	14926	14927	14928	14929	14930*	14931*	14932.	14933.	14934.	14935.	14936.	14937.	14938.	14939.	14940.	14941.
-78	15102	15103	15104	15105	15106	15107*	15108*	15109.	15110.	15111.	15112.	15113.	15114.	15115.	15116.	15117.	15118.	15119.	15120.	15121.
-80	15282*	15283*	15284*	15285.	15286.	15287.	15288.	15289.	15290.	15291.	15292.	15293.	15294.	15295.	15296.	15297.	15298.	15299.	15300.	15301.
I		642/591						643/590					644/589					645/588		
-82	15462.	15463.	15464.	15465.	15466.	15467.	15468.	15469.	15470.	15471.	15472.	15473.	15474.	15475.	15476.	15477.	15478.	15479.	15480.	15481.
-84	15642.	15643.	15644.	15645.	15646.	15647.	15648.	15649.	15650.	15651.	15652.	15653.	15654.	15655.	15656.	15657.	15658.	15659.	15660.	15661.
-86	15822.	15823.	15824.	15825.	15826.	15827.	15828.	15829.	15830.	15831.	15832.	15833.	15834.	15835.	15836.	15837.	15838.	15839.	15840.	15841.
-88	16002.	16003.	16004.	16005.	16006.	16007.	16008.	16009.	16010.	16011.	16012.	16013.	16014.	16015.	16016.	16017.	16018.	16019.	16020.	16021.
-90	16182.	16183.	16184.	16185.	16186.	16187.	16188.	16189.	16190.	16191.	16192.	16193.	16194.	16195.	16196.	16197.	16198.	16199.	16200.	16201.

S. AMERICA — ATLANTIC OCEAN — ANTARCTICA

NORTH POLE BOX2 NO.=1
SOUTH POLE BOX2 NO.=16202

THE SPACE FOLLOWING <BOX2>:
<.>=LAND, <*>=COASTAL, < >=SEA
LANDLOCK FILE=LLN2F1

0 <= LONGITUDE <= 358 EAST
-90 <= LATITUDE <= 90 NORTH

THIS IS FILE <BX2TBF>
OUTPUT OF <BX2TB>
.01C. 83/11/09. 16.43.47.

Comprehensive Ocean–Atmosphere Data Set; Release I
Supplement H: User Software

0. Introduction

FORTRAN 77 software is provided to assist users in unpacking and using some of the available binary data products. As discussed in each product description, it is assumed that the user has the low–level and generally machine–dependent capabilities of 1) transferring a binary block into memory and 2) then extracting into INTEGER variables the bit strings whose lengths are specified. The two capabilities are discussed briefly in secs. 1–3, together with the efficiency and machine–portability considerations that have constrained the design of product formats. A more general discussion including the advantage in execution time and storage relative to traditional techniques can be found in [3].

Source code listings for the available software appear under the filenames given in Table H0–1 . Files are listed on pp. H6–H46 (except that the information in LLN2Fl appears on the 2° box map in supp. G). In addition, the files can be furnished by NCAR's Data Support Section in machine–readable form.

Table H0–1
Available User Software

Filename	Level	Purpose
BOXLIB	.01J	tools for working with 2°, 4° *, and 10° boxes,or Marsden Squares
Q19	.01G	read and print MSU–2
Q112	.01D	read and print CMR.4
Q121	.01D	read and print MSUG.1 group 1
Q122	.01D	read and print MSUG.1 group 2
QI24	.01C	read and print DSU.2
QL14	.01C	read and print MST.3
QL16	.01C	read and print TRP.1
QL21	.01C	read and print CMR.5
QL28	.01C	read and print MSTG.1 group 3
QL29	.01C	read and print MSTG.1 group 4
QL30	.01C	read and print MSTG.1 group 5
QL31	.01C	read and print MSTG.1 group 6
QL32	.01C	read and print MSTG.1 group 7
RDINV	.01B	rf–ad and print INV. 3
READER	.01B	read landlocked file LLN2FI
LLN2F1	n/a	landlocked file

* 4° boxes are similar to 2° boxes. BOX4–3 and –4052 are dedicated to the exact North and South poles, respectively; the remaining boxes 2 through

4051 each enclose four 2° boxes (number 2 has BOX2–2, –3, –182, –183; number 3 has BOX2–4, –5, –184, –185; etc.).

Software may require some modification to work properly on a given machine, because of differences in FORTRAN and computer characteristics, or if the machine dependent capabilities discussed in secs. 1–3 are not available or differ in their implementation. Table HO–2 summarizes known, potential incompatibilities for each filename.

Table H0–2
Potential Incompatibilities

Incompatibility	Filename BOXLIB	Q19–QL32	RDINV	READER	LLN2FI	Reference
FORTRAN 66	X	X[a]	X		n/a	– –
7–char variables		X[b]			n/a	– –
DATE	X	X	X		n/a	this section
TIME	X	X	X		n/a	this section
BPW (bits/word)		X	X[c]		n/a	this section
BUFFER IN		X	X		n/a	sec. 1
UNIT		X	X		n/a	sec. 1
LENGTH		X			n/a	sec. 1
RPTIN		X[d]			n/a	sec. 1
GBYTES		X	X		n/a	sec. 2
DEC computer		X	X		n/a[e]	sec. 3

[a] Limited to use of the PARAMETER statement, those parameters in the DIMENSION and DATA statement, and the apostrophe to delimit literals in PRINT and FORMAT statements.
[b] Only one, INDEXCK.
[c] Called WRDSIZ.
[d] Referenced but never called in the default implementation (since RPTOFF BUFFER IN is called instead). On systems that are rigorous in satisfying program externals, this reference should be made into a comment.
[e] Unless input as binary data.

The more minor of these incompatibilities are discussed in the following; see the referenced section for information about others.

- **DATE**
  This subroutine returns yy/mm/dd." as type CHARACTER* 10.

- **TIME**
  This subroutine returns hh.mm.ss.” as type CHARACTER*10.

- **BPW**
  The INTEGER bits per word is set by default to 60, and must be changed to match the machine word size.

1. Binary Input

The method of handling binary input depends on two levels of organization that are commonly used in storing data on magnetic tape and disk. First, a logical record is the amount of data a user desires access to in one input operation. Examples are an individual monthly summary (for MSTG 384 bits long), or an individual report (for CMR.5 192 bits long). Second, a block (or physical record) is the amount of data a user may be required to access in one input operation because of hardware or system software limitations, and which is characterized by system-recognizable boundaries of various sorts between blocks. Usually, shorter logical records are blocked together into larger physical records for efficiency of storage and input/output (i/o). Although a block may be the real unit of input, in many cases system software can make this distinction transparent to the user.

The software provided here makes use of a non-ANSI but relatively common feature called BUFFER IN to input a binary block, sometimes concurrently with the calling program. The form of BUFFER IN used is

```
BUFFER IN(LUN, M) (K(1), K(N))
```

Where LUN is the unit designator. K is an array that receive the block, N is at least the number of words required to hold a block and no more (on some machines less) than the DIMENSION of K*, and M is a machine-dependent parameter for input mode. The function UNIT must be checked before K is used, to be sure BUFFER IN is done

```
JEOF=UNIT(LUN)
```

* Programs Q19–QL32 have this dimension set to the integer parameter DIM BUF = (1006 * 64 – 1)/BPW + 1 for compatibility with RPTIN. Since RPTIN is not called in the default implementation, DIM BUF can be reduced, if necessary. to the length required to hold one full block (plus 6 initial control words).

and JEOF can be

```
-1 if ready
 0 if end-of-file,
-1 if parity error.
```

The UNIT check must be delayed as long as possible to allow BUFFER IN to work concurrently with the intervening statements. This was not possible in these programs because only one buffer was used: in order to improve clock performance a ”ping-pong” approach that Switches between two buffers could be used. Once UNIT has been checked, the LENGTH(LUN) function can be used. It will return the number of words transferred into K.

Block sizes have been chosen that are evenly divisible by 64-bit and 60-bit words, and thus also by any smaller word size that divides evenly into 64 or 60 (e.g., 16. 32). This is convenient for BUFFER IN, as well as for alternative techniques. One alternative is to read a block in ”A*n*” format where *n* is the number of characters per word. For example. on a 32-bit IBM machine with 8-bit characters,

```
    INTEGER K(1800)
100 READ(1,200) K
200 FORMAT(1800A4)
```

will read one 57,600-bit block (MSTG).

Logical record sizes have also been chosen that are evenly divisible by 64-bit words. This increases the likelihood, on a given machine, that it will be possible to read one logical record at a time. On a 60-bit CDC machine with 6-bit characters,

```
    INTEGER K(4)
100 READ(1,200) K
200 FORMAT(3A10,A2)
```

will read one 192-bit logical record (CMR.5), provided a ”record manager” available with the operating system is advised by

```
FILE(TAPE1,RT = F,FL = 32,RB = 150)
```

to supply a 32-character logical record blocked 150 for every READ.

Binary input can be further simplified on machines where the RPTIN utility is available, and where the data are in RPTIN format. This utility was developed at NCAR for unblocking variable-length logical records, such as LMR, but will work equally well on fixed-length records. A complete description of RPTIN including some of its additional features can be found in 31. In case it is available, RPTIN is offered as an option in this software, which requires that the RPTOFF parameter be changed from its default setting of I (indicating that RPTIN is off) to 0 (indicating that RPTIN is on). Otherwise, RPTIN will be an ”unsatisfied external” that will never be called.

2. Bit-String Manipulations

After a binary block or record is transferred into memory, it will be necessary to extract into INTEGER variables the desired bit strings whose lengths are specified. Subroutines GBYTES and GBYTE are available on some machines for this purpose (together with reverse capabilities SBYTES and SBYTE as described in [3]. GBYTES is used to move N strings of constant-length-B bits from packed array P to unpacked array U, after initially skipping Q bits, and skipping S bits between each string. The call is

```
CALL GBYTES(P,U,Q,B,S,N)
```

where

P and U are indeterminate type arrays of sufficient size, Q,B,S, and N are integers,
$1 \leq Q < \text{word size}$, and $1 \leq B \leq \text{word size}$.

If only one string is required,

```
CALL GBYTE(P,U,Q,B)
```

should be used. In improved implementations the restriction that Q be less than word size is dropped, easing code portability.

Where GBYTES and GBYTE are not available or where efficiency is the primary consideration, other techniques can be used. The Boolean operations AND, OR, SHIFT, and MASK are available on some machines; if not, it is possible to simulate them using integer arithmetic. In many cases string lengths have been chosen that are multiples of 8 bits, in which case it may be possible to treat them as characters on some machines.

3. Note for Users on DEC Equipment

All COADS packed-binary formats were designed and documented using the convention of numbering bits from high-order to low-order within words, and words are thought of as going from lowest address to highest address. This is convenient since it results in simple left to right representation of the data in a string of bits. Most large computers use this convention (IBM, Control Data, Cray, etc.) and most packed-binary formats have been designed using this convention. When 9-track tapes are read or written on such systems, the first 8-bit byte is accessed from or stored in the high-order 8 bits of the first word in the memory i/o buffer. Succeeding bytes are stored in the next lower 8 bits until the first word is filled, and storing continues in the high–order bits of the second word of the buffer.

Since DEC uses a low–order to high–order convention on bits and words. the interpretation of formats using the COADS convention can be somewhat confusing. When 8–bit bytes are read from a 9–track tape on DEC equipment, the first byte on the tape goes into the low–order 8 bits of the first word in the input memory i/o buffer. The result of this is that the 8–bit bytes within each DEC word are in reverse order of what is intended in the format. For example, if the format specifies that the first 12 bits of a data record represent a data value, after a tape is read on a DEC system these 12 bits are contained in the low–order byte followed by the high–order 4 bits of the next higher order byte.

This problem has been solved in different ways by various DEC installations. NCAR has a special version of GBYTES written for local DEC equipment. This routine allows users to think of the data as a string of bits in the COADS sense and access various sized strings of bits in the proper order. A listing of the routine may be requested from NCAR’s Data Support Section.

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```
      PROGRAM TEST
      CHARACTER*10 LEVEL*6,DTE,TME
      INTEGER UNIT
      DATA LEVEL/'.01J. '/
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
    1 FORMAT('1BXPORT',3A)
      WRITE(UNIT,1) LEVEL,DTE,TME
      RETURN
      END
C     ****************************************************************
C     -----BXPORT, SOURCE CODE FOR BOXLIB
C          A LIBRARY OF TOOLS FOR USING BOXES AND OTHER GLOBAL
C          GRID SYSTEMS, E.G. MARSDEN SQUARES. THE BOX SYSTEMS ARE:
C            GENERIC NAME    SPECIFIC NAME    POLAR BOXES    X-ORIGIN
C            ============    =============    ===========    ========
C                BOX2            BX16202          YES           0E
C                BOX4            BX4052           YES           0E
C                BOX10           BX648            NO           30E
C
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE        DESCRIPTION
C      ===== ====== ==========  ====================
C      .01A. ---    83/07/20.   ORIGINAL VERSION TAKEN QLIBS.01I VIA F45
C      .01B. SDW    83/07/21.   UPDATES BOX10 TOOLS TO CURRENT SYSTEM
C      .01C. SDW    84/05/02.   FIX ERROR IN <XYBQ>, COMMENT OUT <XYMSQ>,
C                               AND ADD <B1026>.
C      .01D. TSP    84/10/05.   FIXED <B10XYO> TO ADJUST FOR 30 DEGREE
C                               SHIFT OF B10 SYSTEM
C      .01E. TSP    84/10/08.   FIXED ERRORS IN <MSQB10>
C      .01F. TSP    84/10/08.   FIXED <XYMSQ> AND <MSQXYO>
C      .01G. TSP    84/10/09.   DELETED <B25> AND <B52>, TRIMMED ALL
C                               LINES TO 72 CHARACTERS MAXIMUM
C      .01H. TSP    84/10/09.   DELETED <B5XYO>, <MSQ5>, AND <XYB5>
C      .01I. TSP    84/10/10.   CHANGED NAMES OF SOURCE AND
C                               OBJECT CODE.
C      .01J. TSP    84/10/15.   DELETED BOX5 AND AUTHOR COMMENT LINES.
C     -----------------------------------------------------------------
C     ===1=========2=========3=========4=========5=========6=========7==
      INTEGER FUNCTION B10MSQ(MSQ)
C     -----------EQUALS -1 IF ILLEGAL MSQ ELSE EQUALS EQUIVALENT B10
      IMPLICIT INTEGER(A-Z)
      IF(MSQ.GE.1.AND.MSQ.LE.288)THEN
        SQR=MSQ+35
      ELSE IF(MSQ.GE.300.AND.MSQ.LE.623)THEN
        SQR=-1*(MSQ-300)
      ELSE IF(MSQ.GE.901.AND.MSQ.LE.936)THEN
        SQR=MSQ-577
      ELSE
        GOTO 900
      ENDIF
      B10MSQ=(9-SQR/36)*36 +(71-MOD(IABS(SQR),36))
     +                     -(71-MOD(IABS(SQR),36))/39*36 -2
```

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```
      RETURN
  900 B10MSQ=-1
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
      LOGICAL FUNCTION B1026(B2,B26,B10)
C     -----------FALSE IF 1>@B10>648, ELSE TRUE SUCH THAT @B2 CONTAINS
C                THE 25 BOX2 CONTAINED BY BOX10 @B10 IN NUMERICAL ORDER,
C                AND @B26 CONTAINS ZERO OR THE 26TH BOX2 FOR THE POLAR
C                BOX10.
      IMPLICIT INTEGER(A-Z)
      LOGICAL XYB10,B2XYO
      DIMENSION B2(25)
      JB=B26=0
      B1026=.FALSE.
      IF(.NOT.XYB10(X1,Y2,B10)) RETURN
      X2=X1+80
      Y1=Y2+80
      DO 500 Y=Y1,Y2,-20
      DO 500 X=X1,X2, 20
        IF(.NOT.B2XYO(X,Y,BOX2)) RETURN
        JB=JB+1
        B2(JB)=BOX2
  500 CONTINUE
      IF(B10.EQ.  1) B26=    1
      IF(B10.EQ.648) B26=16202
      B1026=.TRUE.
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
      LOGICAL FUNCTION B10XYO(X,Y,B10)
C     -----------PERFORM <BQXYO> ON 10 DEGREE BOX CORNER @X,@Y
      IMPLICIT INTEGER(A-E,G-Z)
      LOGICAL BQXYO
      DATA Q/100/,XDIM/36/,Y1/800/,YMOVE/8/,X2/3500/
C       -- SHIFT LATITUDE X 30 DEGREES WEST TO COMPUTE USING BQXYO
      IF (X .GE. 300) THEN
        XS=X-300
      ELSE
        XS=X+3300
      ENDIF
      B10XYO=BQXYO(XS,Y,B10,Q,XDIM,Y1,YMOVE,X2)
C       -- SUBTRACT 1 FROM BOX # TO ADJUST FOR LACK OF NORTH POLAR BOX
      B10=B10-1
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
C     *F45V1PO*
      LOGICAL FUNCTION B2XYO(X,Y,B2)
C     -----------PERFORM <BQXYO> ON 2 DEGREE BOX CORNER @X,@Y
      IMPLICIT INTEGER(A-E,G-Z)
      LOGICAL BQXYO
      DATA Q/20/,XDIM/180/,Y1/880/,YMOVE/44/,X2/3580/
      B2XYO=BQXYO(X,Y,B2,Q,XDIM,Y1,YMOVE,X2)
      RETURN
      END
```

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```
C     ===1=========2=========3=========4=========5=========6=========7==
C     *F45V1P0*
      LOGICAL FUNCTION B4XYO(X,Y,B4)
C      ---- FALSE IF @X,@Y ARE NOT THE LOWER-LEFT (SW) CORNER OF A
C           @Q/10 DEGREE BOX IN 10THS DEGREE +N,-S,E.
C           ELSE TRUE RETURNING THE BOX NUMBER @B4
C           WHERE @XDIM  IS THE NUMBER OF BOXES PER LAT ZONE
C                 @Y1    IS 900-@Q
C                 @X2    IS THE LARGEST X
C
C       WARNING - DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C                 <B4XYO> CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C                 CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C                 -85 TO -90 DEGREE LATITUDE BAND HAVE (@X,@Y)=(0,-900)
C                 AS THEIR SOUTHWEST CORNER.  THUS <B4XYO> CANNOT TELL
C                 WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,-900).
C
C                 <B4XYO> RETURNS .FALSE. FOR NORTH POLAR BOX.
C                         RETURNS .TRUE. FOR SOUTH POLAR BOX; BUT
C                         THE RETURNED BOX IS NOT THE SOUTH POLAR
C                         BOX.
C
      IMPLICIT INTEGER(A-E,G-Z)
      DATA Q/40/,XDIM/90/,Y1/860/,X2/3560/
      IF(MOD(X,Q).EQ.0.AND.MOD(900-Y,Q).EQ.0.AND.
     +  (X.GE.0.AND.X.LE.X2)                .AND.
     +  (Y.GE.-900.AND.Y.LE.Y1)) GOTO 200
      B4XYO=.FALSE.
      RETURN
  200 B4=((900-Y)/Q-1)*XDIM+X/Q+2
      B4XYO=.TRUE.
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
C     *F45V1P0*
      LOGICAL FUNCTION BQXYO(X,Y,BQ,Q,XDIM,Y1,YMOVE,X2)
C     ------FALSE IF @X,@Y ARE NOT THE LOWER-LEFT (SW) CORNER OF A @Q/10
C           DEGREE BOX IN 10THS DEGREE +N,-S,E; EXCLUDING POLAR BOXES
C           ELSE TRUE RETURNING THE BOX NUMBER @BQ
C           WHERE @XDIM  IS THE NUMBER OF BOXES PER LAT ZONE
C                 @Y1    IS 900-@Q
C                 @YMOVE IS (900/@Q)-1
C                 @X2    IS THE LARGEST X
C
C       WARNING - DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C                 <BQXYO> CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C                 CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C                 -85 TO -90 DEGREE LATITUDE BAND HAVE (@X,@Y)=(0,-900)
C                 AS THEIR SOUTHWEST CORNER.  THUS <BQXYO> CANNOT TELL
C                 WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,-900).
C
C                 <BQXYO> RETURNS .FALSE. FOR NORTH POLAR BOX.
C                         RETURNS .TRUE. FOR SOUTH POLAR BOX; BUT
C                         THE RETURNED BOX IS NOT THE SOUTH POLAR
C                         BOX.
C
```

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```
      IMPLICIT INTEGER(A-E,G-Z)
      IF(MOD(X,Q).EQ.O.AND.MOD(Y,Q).EQ.O.AND.
     +  (X.GE.O.AND.X.LE.X2)              .AND.
     +  (Y.GE.-900.AND.Y.LE.Y1)) GOTO 200
      BQXYO=.FALSE.
      RETURN
  200 BQ=(YMOVE-Y/Q)*XDIM+X/Q+2
      BQXYO=.TRUE.
      RETURN
C     **  THIS PROGRAM VALID ON FTN4 AND FTN5 **
      END
C     ===1=========2=========3=========4=========5=========6=========7==
      INTEGER FUNCTION MSQB10(B10)
C     -----------EQUALS -1 IF ILLEGAL B10, ELSE EQUALS EQUIVALENT MSQ
      IMPLICIT INTEGER(A-E,G-Z)
      MSQB10=-1
      M=MOD(B10,36)
      IF (M .EQ. 0) M=36
      IF (B10 .GE. 1 .AND. B10 .LE. 33) THEN
         MSQB10 = 934-B10
       ELSE
         MSQB10 = 970-B10
      ENDIF
      IF (B10 .GE. 37 .AND. B10 .LE. 324) THEN
       IF (M .GE. 1 .AND. M .LE. 33) THEN
         MSQB10 = 322-B10
        ELSE
         MSQB10 = 358-B10
      ENDIF
      ENDIF
      IF (B10 .GE. 325 .AND. B10 .LE. 648) THEN
       IF (M .GE. 1 .AND. M .LE. 33) THEN
         MSQB10 = 333-M+((AINT(B10/36.0)-9)*36)
        ELSE IF (M .EQ. 34 .OR. M .EQ. 35) THEN
           MSQB10 = 369-M+((AINT(B10/36.0)-9)*36)
          ELSE IF (M .EQ. 36) THEN
            MSQB10 = 333+((AINT(B10/36.0)-10)*36)
        ENDIF
      ENDIF
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
C     *F45V1P0*
      LOGICAL FUNCTION MSQXYO(X,Y,MSQ)
C     -----------RETURNS MSQ BOX# @MSQ GIVEN 10 DEGREE BOX CORNER @X, @Y
C                RETURNS FALSE IF @X,@Y IS NOT THE CORNER OF A 10 DEGREE
C                BOX.
C
C                <MSQXYO> USES <BQXYO> - SEE WARNING BELOW.
C
C       WARNING - DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C                 <BQXYO> CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C                 CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C                 -85 TO -90 DEGREE LATITUDE BAND HAVE (@X,@Y)=(0,-900)
C                 AS THEIR SOUTHWEST CORNER.  THUS <BQXYO> CANNOT TELL
C                 WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,-900).
```

```
C
C                 <BQXYO> RETURNS .FALSE. FOR NORTH POLAR BOX.
C                         RETURNS .TRUE. FOR SOUTH POLAR BOX; BUT
C                         THE RETURNED BOX IS NOT THE SOUTH POLAR
C                         BOX.
C
      IMPLICIT INTEGER(A-E,G-Z)
      LOGICAL BQXYO
C      -- SHIFT LATITUDE X 30 DEGREES WEST TO COMPUTE USING BQXYO
      IF (X .GE. 300) THEN
        XS=X-300
      ELSE
        XS=X+3300
      ENDIF
      DATA Q/100/,XDIM/36/,Y1/800/,YMOVE/8/,X2/3500/
      MSQXYO=BQXYO(XS,Y,BQ,Q,XDIM,Y1,YMOVE,X2)
C      -- SUBTRACT 1 FROM BOX # TO ADJUST FOR LACK OF POLAR BOX AND
C         RECALCULATE THE EQUIVALENT MARSDEN SQUARE
      MSQ=MSQB10(BQ-1)
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
      INTEGER FUNCTION QCDCXY(X,Y)
C     ------RETURNS -1 UNLESS 900<@Y<-900, 3599<@X<0, @X<>1800 (10THS E)
C           RETURNS THE NCDC QUADRANT 1=NW,2=NE,3=SW,4=SE OTHERWISE
      IMPLICIT INTEGER(A-E,G-Z)
      IF(Y.LT.900.AND.Y.GT.-900.AND.X.LT.3599.AND.X.GT.0.AND.X.NE.1800)
     + THEN
        QCDCXY=1
        IF(X.LT.1800) QCDCXY=QCDCXY+1
        IF(Y.LT.0)    QCDCXY=QCDCXY+2
      ELSE
        QCDCXY=-1
      ENDIF
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
      LOGICAL FUNCTION XYB10(X,Y,B10)
C     -----------PERFORM <XYBQ> ON A 10 DEGREE BOX @B10
      IMPLICIT INTEGER(A-E,G-Z)
      LOGICAL XYBQ
      DATA Q/100/,LAST/648/,XDIM/36/,Y1/800/,POLE/1/,XMOVE/300/
      XYB10=XYBQ(X,Y,B10,Q,LAST,XDIM,Y1,POLE,XMOVE)
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
C     *F45V1P0*
      LOGICAL FUNCTION XYB2(X,Y,B2)
C     -----------PERFORM <XYBQ> ON A 2 DEGREE BOX @B2
      IMPLICIT INTEGER(A-E,G-Z)
      LOGICAL XYBQ
      DATA Q/20/,LAST/16202/,XDIM/180/,Y1/880/,POLE/2/,XMOVE/0/
      XYB2=XYBQ(X,Y,B2,Q,LAST,XDIM,Y1,POLE,XMOVE)
      RETURN
      END
C     ===1=========2=========3=========4=========5=========6=========7==
```

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```
C      *F45V1P0*
       LOGICAL FUNCTION XYB4(X,Y,B4)
C      -----------PERFORM <XYBQ> ON A 4 DEGREE BOX @B4
       IMPLICIT INTEGER(A-E,G-Z)
       LOGICAL XYBQ
       DATA Q/40/,LAST/4052/,XDIM/90/,Y1/860/,POLE/2/,XMOVE/0/
       XYB4=XYBQ(X,Y,B4,Q,LAST,XDIM,Y1,POLE,XMOVE)
       RETURN
       END
C      ===1=========2=========3=========4=========5=========6=========7==
C      *F45V1P0*
       LOGICAL FUNCTION XYBQ(X,Y,BQ,Q,LAST,XDIM,Y1,POLE,XMOVE)
C      ------FALSE IF 1>BQ>@LAST, ELSE TRUE SUCH THAT @X,@Y ARE THE
C            LAT,LON IN 10THS DEGREE +N,-S,E OF LOWER-LEFT (SW) CORNER
C            OF @Q/10 DEGREE BOX @BQ;  POLAR @X ARE SET TO 0
C            WHERE @LAST  IS THE LAST BOX NUMBER
C                  @XDIM  IS THE NUMBER OF BOXES PER LAT ZONE
C                  @Y1    IS 900-@Q
C                  @POLE  IS 1 IF 0 POLAR BOXES, 2 IF 2 POLAR BOXES
C                  @XMOVE IS THE X-ORIGIN
       IMPLICIT INTEGER(A-E,G-Z)
       XYBQ=.FALSE.
       IF(BQ.LT.1.OR.BQ.GT.LAST) RETURN
       IF(POLE.EQ.1) GOTO 200
       IF(BQ.NE.1) GOTO 100
       X=0
       Y= 900
       GOTO 900
  100  IF(BQ.NE.LAST) GOTO 200
       X=0
       Y=-900
       GOTO 900
  200  CONTINUE
       X=MOD(BQ-POLE,XDIM)*Q+XMOVE
       IF(X.GE.3600) X=X-3600
       Y=Y1-(BQ-POLE)/XDIM*Q
  900  XYBQ=.TRUE.
       RETURN
C      **  THIS PROGRAM VALID ON FTN4 AND FTN5 **
       END
C      ===1=========2=========3=========4=========5=========6=========7==
       LOGICAL FUNCTION XYMSQ(X,Y,MSQ)
C      ---------- PERFORM <B10MSQ> TO CONVERT @MSQ TO @B10, THEN USES
C                 <XYBQ> TO FIND LAT. AND LONG. OF EQUIVALENT @B10
       IMPLICIT INTEGER(A-E,G-Z)
       LOGICAL XYBQ
       B10 = B10MSQ(MSQ)
       DATA Q/100/,LAST/648/,XDIM/36/,Y1/800/,POLE/1/,XMOVE/300/
       XYMSQ=XYBQ(X,Y,B10,Q,LAST,XDIM,Y1,POLE,XMOVE)
       RETURN
       END
```

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```
      PROGRAM QI9
C-----READ AND PRINT MSU2
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY---------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01G. SL     85/01/24.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=100,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=1600,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=117)
C
      COMMON /MSU2/FUNITS(117),FBASE(117),BITS(117),OFFSET(117)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(8,14)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01G/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI9',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,FTRUE
300   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0,' BOX10 ',F4.0
     +,' CHECKSUM ',F6.0/
     +8X,'S',7X,'A',7X,'W',7X,'U',7X,'V',7X,'P',7X,'C',7X,'Q'/
     +1X,'D',8F8.1/
     +1X,'H',8F8.1/
     +1X,'X',8F8.2/
     +1X,'Y',8F8.2/
     +1X,'N',8F8.0/
     +1X,'M',6F8.2,F8.1,F8.2/
     +1X,'S',6F8.2,F8.1,F8.2/
     +1X,'0',6F8.2,F8.1,F8.2/
     +1X,'1',6F8.2,F8.1,F8.2/
     +1X,'2',6F8.2,F8.1,F8.2/
     +1X,'3',6F8.2,F8.1,F8.2/
```

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```
     +1X,'4',6F8.2,F8.1,F8.2/
     +1X,'5',6F8.2,F8.1,F8.2/
     +1X,'6',6F8.2,F8.1,F8.2)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=========================================================================
      BLOCK DATA MSU2
      IMPLICIT INTEGER(A-E,G-Z)
      COMMON /MSU2/FUNITS(117),FBASE(117),BITS(117),OFFSET(117)
C
      DATA FUNITS/5*1.
     +,8*.2,8*.1,16*.01,8*1.
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01
     +,6*.01,.1,.01/
C
      DATA FBASE/1799,4*0
     +,8*4,24*-1,8*0,-501,-8801,-1,2*-10221,86999,2*-1,8*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1
     +,-501,-8801,-1,2*-10221,86999,2*-1/
C
      DATA BITS/8,4,14,10,12,32*8,80*16/
C
      DATA OFFSET/
     +   16,  24,  28,  42,  52,  64,  72,  80,  88,  96, 104, 112, 120
     +, 128, 136, 144, 152, 160, 168, 176, 184, 192, 200, 208, 216, 224
     +, 232, 240, 248, 256, 264, 272, 280, 288, 296, 304, 312, 320, 336
     +, 352, 368, 384, 400, 416, 432, 448, 464, 480, 496, 512, 528, 544
     +, 560, 576, 592, 608, 624, 640, 656, 672, 688, 704, 720, 736, 752
     +, 768, 784, 800, 816, 832, 848, 864, 880, 896, 912, 928, 944, 960
     +, 976, 992,1008,1024,1040,1056,1072,1088,1104,1120,1136,1152,1168
     +,1184,1200,1216,1232,1248,1264,1280,1296,1312,1328,1344,1360,1376
     +,1392,1408,1424,1440,1456,1472,1488,1504,1520,1536,1552,1568,1584/
      END
C=========================================================================
      SUBROUTINE GETRPT(TAPE,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
C
C-----RETURN FLOATING POINT VALUES IN FTRUE
C
C     INPUT
C         TAPE - RPTIN/RCDIN UNIT
C         FMISS - MISSING VALUE
```

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```
C          FUNITS(DIM UN) - UNITS FOR UNCODING
C          FBASE(DIM UN) - BASE FOR UNCODING
C          BITS(DIM UN) - BITS FOR UNPACKING
C          OFFSET(DIM UN) - OFFSET FOR UNPACKING
C          INDEXCK - UN(INDEXCK) = CHECKSUM
C          ID - GROUP NUMBER FOR IDENTIFICATION CHECKSUM
C          BPR - BITS PER REPORT
C          BPW - BITS PER WORD
C          RPTOFF - 0=FALSE 1=TRUE
C      OUTPUT
C          BUF(DIM BUF) - RPTIN/RCDIN BUFFER
C          PK(DIM PK) - PACKED REPORT
C          UN(DIM UN) - UNPACKED REPORT
C          FTRUE(DIM UN) - TRUE VALUES
C          JEOF - 0=FALSE 1=TRUE
C
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FUNITS(DIM UN),FBASE(DIM UN),BITS(DIM UN),OFFSET(DIM UN)
     +,BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----RPTIN/RCDIN
      IF(RPTOFF.NE.0)GOTO 100
      CALL RPTIN(TAPE,BUF,PK,KWDS,1,DIM PK,JEOF)
      GOTO 110
100   CALL RCDIN(TAPE,BUF,DIM BUF,PK,DIM PK,BPR,BPW,JEOF)
110   IF(JEOF-1)200,900,800
C
C-----GBYTE AND CONVERT TO TRUE
200   CK=ID
      DO 230 I=1,DIM UN
      CALL GBYTE(PK(OFFSET(I)/BPW+1),UN(I),MOD(OFFSET(I),BPW),BITS(I))
      IF(I.EQ.INDEXCK)GOTO 210
      IF(UN(I).EQ.0)GOTO 220
      FTRUE(I)=(UN(I)+FBASE(I))*FUNITS(I)
      CK=CK+UN(I)
      GOTO 230
210   FTRUE(INDEXCK)=UN(INDEXCK)
      GOTO 230
220   FTRUE(I)=FMISS
230   CONTINUE
      IF(MOD(CK,2**BITS(INDEXCK)-1).EQ.UN(INDEXCK))RETURN
C
C-----ERROR
      PRINT *,' SUBROUTINE GETRPT  --  CHECKSUM ERROR, TAPE = ',TAPE
     +,', REPORT = ',BUF(2)
      PRINT *,' FTRUE = ',FTRUE
800   STOP
C
900   END
C======================================================================
      SUBROUTINE RCDIN(TAPE,BUF,DIM BUF,RCD,DIM RCD,BPR,BPW,JEOF)
C
C-----RETURN ONE LOGICAL RECORD IN RCD
C
C      INPUT
C          TAPE - BUFFER IN UNIT
```

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```
C         BPR - BITS PER RECORD
C         BPW - BITS PER WORD
C      OUTPUT
C         BUF(DIM BUF) - PHYSICAL RECORD
C         RCD(DIM RCD) - LOGICAL RECORD
C         JEOF - 0=FALSE 1=TRUE
C
C      BUF(1) = GBYTE OFFSET
C      BUF(2) = LOGICAL RECORD COUNT
C      BUF(3) = PHYSICAL RECORD COUNT
C      BUF(4) =
C      BUF(5) = BLOCK LENGTH IN BITS
C      BUF(6) =
C
       IMPLICIT INTEGER(A-E,G-Z)
       REAL UNIT
       DIMENSION BUF(DIM BUF),RCD(DIM RCD)
C
       IF(BUF(1)+BPR.LE.BUF(5))GOTO 200
C-----BUFFER IN
10     BUFFER IN(TAPE,1)(BUF(7),BUF(DIM BUF))
       JEOF=UNIT(TAPE)+1
       IF(JEOF-1)100,100,800
100    BUF(1)=0
       BUF(5)=LENGTH(TAPE)*BPW
       IF(JEOF.EQ.1)RETURN
       BUF(3)=BUF(3)+1
C
C-----GBYTE
200    CALL GBYTES
      +(BUF(6+BUF(1)/BPW+1)  ,RCD  ,MOD(BUF(1),BPW)  ,BPW  ,0  ,DIM RCD)
       IF(RCD(1).EQ.0.AND.RCD(2).EQ.0)GOTO 10
       BUF(1)=BUF(1)+BPR
       BUF(2)=BUF(2)+1
       RETURN
C
C-----ERROR
800    PRINT *,' SUBROUTINE RCDIN  --  BUFFER IN ERROR, TAPE = ',TAPE
      +,', BLOCK = ',BUF(3)+1
       STOP
       END
```

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```
      PROGRAM QI12
C-----READ AND PRINT CMR4
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY----------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01D. SL     85/01/25.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=300,RPTOFF=1,FMISS=-999.9,INDEXCK=30,BPR=192,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=30)
C
      COMMON /CMR4/FIELD(30),FTRUEL(30),FTRUEU(30),FUNITS(30)
     +,FBASE(30),BITS(30),OFFSET(30)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
      DATA LEVEL/4H.01D/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI12',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,(FIELD(I),FTRUE(I),I=1,DIM UN)
300   FORMAT(6(1X,A5,F7.1))
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=======================================================================
      BLOCK DATA CMR4
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /CMR4/FIELD(30),FTRUEL(30),FTRUEU(30),FUNITS(30)
     +,FBASE(30),BITS(30),OFFSET(30)
C
      DATA FIELD/
     +8HBOX10    ,8HMONTH    ,8HBOX2     ,8HYEAR     ,8HDAY      ,
     +8HHOUR     ,8HX        ,8HY        ,8HS        ,8HBI       ,
     +8HA        ,8HDP       ,8HTI       ,8HW        ,8HWI       ,
     +8HU        ,8HV        ,8HDI       ,8HP        ,8HC        ,
```

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```
     +8HNH      ,8HCL      ,8HH      ,8HHI      ,8HCM      ,
     +8HCH      ,8HST      ,8HPW     ,8HCD      ,8HCK      /
C
      DATA FTRUEL/
     +3*1.,1800.,1.,3*0.,-5.,0.,-88.,4*0.,2*-102.2,0.,870.,11*0./
C
      DATA FTRUEU/
     +648.,12.,16202.,2054.,31.,23.,2*2.,40.,2.,58.,70.,5.,102.2,1.
     +,2*102.2,5.,1074.6,2*9.,2*10.,1.,2*10.,7.,99.,999.,62./
C
      DATA FUNITS/
     +6*1.,3*.1,1.,2*.1,1.,.1,1.,2*.1,1.,.1,11*1./
C
      DATA FBASE/
     +3*0,1799,0,3*-1,-51,-1,-881,4*-1,2*-1023,-1,8699,10*-1,0/
C
      DATA BITS/
     +10,4,14,8,4*5,9,2,11,10,3,10,2,2*11,3,11,4*4,2,3*4,7,10,6/
C
      DATA OFFSET/
     +   0, 10, 14, 28, 36, 41, 46, 51, 56, 65, 67, 78, 88, 91,101
     +,103,114,125,128,139,143,147,151,155,157,161,165,169,176,186/
      END
C======================================================================

   -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

```
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      PROGRAM QI21
C-----READ AND PRINT MSUG1 GROUP1
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01D. SL     85/01/25.  REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=1
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01D/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI21',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSUG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSUG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +8X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'S',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
```

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```
     +1X,'A',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
     +1X,'P',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
     +1X,'Q',2F8.2,F8.0,F8.2,2F8.0,2F8.1)
      END
C=====================GROUP 1==========================================
      BLOCK DATA MSUG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/5*1.
     +,4*.01
     +,4*.01
     +,4*1.
     +,4*.01
     +,4*2.
     +,4*2.
     +,4*.2
     +,4*.2/
C
      DATA FBASE/1799,4*0
     +,-501.,-8801.,86999.,-1.
     +,-501.,-8801.,86999.,-1.
     +,4*0.
     +,4*-1.
     +,4*0.
     +,4*-.5
     +,4*-.5
     +,4*-.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C=====================================================================

   ----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----
```

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```
      PROGRAM QI22
C-----READ AND PRINT MSUG1 GROUP 2
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY---------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01D. SL     85/01/25.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=2
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01D/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI22',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSUG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSUG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +8X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'W',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
```

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```
     +1X,'U',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
     +1X,'V',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
     +1X,'C',2F8.1,F8.0,F8.1,2F8.0,2F8.1)
      END
C=====================GROUP 2=========================================
      BLOCK DATA MSUG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/5*1.
     +,3*.01,.1
     +,3*.01,.1
     +,4*1.
     +,3*.01,.1
     +,4*2.
     +,4*2.
     +,4*.2
     +,4*.2/
C
      DATA FBASE/1799,4*0
     +,-1.,2*-10221.,-1.
     +,-1.,2*-10221.,-1.
     +,4*0.
     +,4*-1.
     +,4*0.
     +,4*-.5
     +,4*-.5
     +,4*-.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C====================================================================
```

----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----

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```
      PROGRAM QI24
C-----READ AND PRINT DSU2
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY---------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=250,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=960,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=58)
C
      COMMON /DSU2/FUNITS(58),FBASE(58),BITS(58),OFFSET(58)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(8,6)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI24',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,FTRUE
300   FORMAT(/' DECADE ',F4.0,' MONTH ',F3.0,' BOX2 ',F6.0,' BOX10 '
     +,F4.0,' CHECKSUM ',F6.0/
     +8X,'0',7X,'1',7X,'2',7X,'3',7X,'4',7X,'5',7X,'6',7X,'N'/
     +1X,'S',7F8.2,F8.0/
     +1X,'A',7F8.2,F8.0/
     +1X,'U',7F8.2,F8.0/
     +1X,'V',7F8.2,F8.0/
     +1X,'P',7F8.2,F8.0/
     +1X,'R',7F8.1,F8.0/
     +1X,' U ',F8.2,' V ',F8.2,' UV ',F8.2,' UU ',F8.2,' VV ',F8.2)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
```

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```
C======================================================================
      BLOCK DATA DSU2
      IMPLICIT INTEGER(A-E,G-Z)
      COMMON /DSU2/FUNITS(58),FBASE(58),BITS(58),OFFSET(58)
C
      DATA FUNITS/5*1.
     +,7*.01,1. ,7*.01,1. ,7*.01,1. ,7*.01,1. ,7*.01,1. ,7*.1,1.
     +,5*.01/
C
     +,FBASE/179,4*0
     +,7*-501,0 ,7*-8801,0 ,7*-10221,0 ,7*-10221,0 ,7*86999,0 ,7*-1,0
     +,2*-10221,-522243,2*-1/
C
     +,BITS/8,4,14,10,12,50*16,3*32/
C
     +,OFFSET/
     +  16, 24, 28, 42, 52, 64, 80, 96,112,128,144,160,176,192,208,224
     +,240,256,272,288,304,320,336,352,368,384,400,416,432,448,464,480
     +,496,512,528,544,560,576,592,608,624,640,656,672,688,704,720,736
     +,752,768,784,800,816,832,848,864,896,928/
      END
C======================================================================
```

----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----

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```
      PROGRAM QL14
C-----READ AND PRINT MST3
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY---------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=60,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=3712,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=271)
C
      COMMON /MST3/FUNITS(271),FBASE(271),BITS(271),OFFSET(271)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(19,14)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL14',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,(FTRUE(I),I=1,5)
300   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'D',7X,'H',7X,'X',7X,'Y',7X,'N',7X,'M',7X,'S'
     +  ,7X,'0',7X,'1',7X,'2',7X,'3',7X,'4',7X,'5',7X,'6')
      PRINT 301,((FTRUE2(I,J),J=1,14),I=1,19)
301   FORMAT(1X,'S       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'A       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'W       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'U       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'V       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'P       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'C       ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'Q       ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'R       ',F8.1,3F8.2,F8.0,9F8.1/
```

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```
     +1X,'S-A      ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'(S-A)*W  ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'QS-Q     ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'(QS-Q)*W',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'W*U      ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'W*V      ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'U*A      ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'V*A      ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'U*Q      ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'V*Q      ',F8.1,3F8.2,F8.0,9F8.1)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=========================================================================
      BLOCK DATA MST3
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MST3/FUNITS(271),FBASE(271),BITS(271),OFFSET(271)
C
      DATA FUNITS/5*1.
     +,19*.2,57*.01,19*1.
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1
     +,6*.01,.1,.01,.1,.01,.1,.01,7*.1/
C
      DATA FBASE/1799,4*0
     +,19*4,57*-1,19*0
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,19*-1
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001
     +,-501,-8801,-1,2*-10221,86999,3*-1
     +,-6301,-10001,-4001,-10001,2*-30001,2*-20001,2*-10001/
C
      DATA BITS/8,4,14,10,12,76*8,190*16/
C
      DATA OFFSET/ 16, 24, 28, 42, 52, 64
     +, 72, 80, 88, 96,104,112,120,128,136,144,152,160,168,176,184,192
```

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```
     +,200,208,216,224,232,240,248,256,264,272,280,288,296,304,312,320
     +,328,336,344,352,360,368,376,384,392,400,408,416,424,432,440,448
     +,456,464,472,480,488,496,504,512,520,528,536,544,552,560,568,576
     +,584,592,600,608,616,624,632,640,648,656,664,672,688,704,720,736
     +,752,768,784,800,816,832,848,864,880,896,912,928,944,960,976,992
     +,1008,1024,1040,1056,1072,1088,1104,1120,1136,1152,1168,1184,1200
     +,1216,1232,1248,1264,1280,1296,1312,1328,1344,1360,1376,1392,1408
     +,1424,1440,1456,1472,1488,1504,1520,1536,1552,1568,1584,1600,1616
     +,1632,1648,1664,1680,1696,1712,1728,1744,1760,1776,1792,1808,1824
     +,1840,1856,1872,1888,1904,1920,1936,1952,1968,1984,2000,2016,2032
     +,2048,2064,2080,2096,2112,2128,2144,2160,2176,2192,2208,2224,2240
     +,2256,2272,2288,2304,2320,2336,2352,2368,2384,2400,2416,2432,2448
     +,2464,2480,2496,2512,2528,2544,2560,2576,2592,2608,2624,2640,2656
     +,2672,2688,2704,2720,2736,2752,2768,2784,2800,2816,2832,2848,2864
     +,2880,2896,2912,2928,2944,2960,2976,2992,3008,3024,3040,3056,3072
     +,3088,3104,3120,3136,3152,3168,3184,3200,3216,3232,3248,3264,3280
     +,3296,3312,3328,3344,3360,3376,3392,3408,3424,3440,3456,3472,3488
     +,3504,3520,3536,3552,3568,3584,3600,3616,3632,3648,3664,3680,3696/
      END
C=======================================================================

   -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

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```
      PROGRAM QL16
C-----READ AND PRINT TRP1
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=250,RPTOFF=1,FMISS=0.,INDEXCK=5,BPR=256,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=23)
C
      COMMON /TRP1/FUNITS(23),FBASE(23),BITS(23),OFFSET(23)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(6,3)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL16',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,FTRUE
300   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0,' BOX10 ',F4.0
     +,' CHECKSUM ',F5.0/
     +,9X,'S ',6X,'A ',6X,'U ',6X,'V ',6X,'P ',6X,'R '/
     +,1X,'NI',6F8.0/
     +,1X,'NL',6F8.0/
     +,1X,'NU',6F8.0)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      BLOCK DATA TRP1
      IMPLICIT INTEGER(A-E,G-Z)
C
```

```
      COMMON /TRP1/FUNITS(23),FBASE(23),BITS(23),OFFSET(23)
C
      DATA FUNITS/5*1.
     +,18*1./
C
     +,FBASE/1799,4*0
     +,18*0/
C
     +,BITS/8,4,14,10,12
     +,6*12,12*10/
C
     +,OFFSET/ 16, 24, 28, 42, 52
     +, 64, 76, 88,100,112,124,136,146,156,166,176,186,196,206,216,226
     +,236,246/
      END
C=======================================================================

   -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

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```
      PROGRAM QL21
C-----READ AND PRINT CMR5
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY-------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ===================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     ----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=300,RPTOFF=1,FMISS=-999.9,INDEXCK=35,BPR=192,ID=0
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=35)
C
      COMMON /CMR5/FIELD(35),FTRUEL(35),FTRUEU(35),FUNITS(35)
     +,FBASE(35),BITS(35),OFFSET(35)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL21',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,(FIELD(I),FTRUE(I),I=1,DIM UN)
300   FORMAT(6(1X,A5,F7.1))
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C======================================================================
      BLOCK DATA CMR5
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /CMR5/FIELD(35),FTRUEL(35),FTRUEU(35),FUNITS(35)
     +,FBASE(35),BITS(35),OFFSET(35)
C
      DATA FIELD/8HBOX10    ,8HMONTH   ,8HBOX2    ,8HYEAR    ,8HDAY     ,
     +8HHOUR    ,8HX       ,8HY       ,8HS       ,8HBI      ,8HA       ,
     +8HDP      ,8HTI      ,8HU       ,8HV       ,8HDI      ,8HWI      ,
     +8HP       ,8HC       ,8HNH      ,8HCL      ,8HH       ,8HHI      ,
     +8HCM      ,8HCH      ,8HST      ,8HPW      ,8HCD      ,8HLF      ,
```

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```
     +8HSF       ,8HAF       ,8HRF       ,8HWF       ,8HPF       ,8HCK       /
C
      DATA FTRUEL/3*1.,1800.,1.,3*0.,-5.,0.,-88.,2*0.,2*-102.2,2*0.,870.
     +,17*0./
C
      DATA FTRUEU/648.,12.,16202.,2054.,31.,23.,2*2.,40.,2.,58.,70.,5.
     +,2*102.2,5.,1.,1074.6,2*9.,2*10.,1.,2*10.,7.,99.,999.,0.,5*2.,30./
C
      DATA FUNITS/6*1.,3*.1,1.,2*.1,1.,2*.1,2*1.,.1,17*1./
C
      DATA FBASE/3*0,1799,0,3*-1,-51,-1,-881,2*-1,2*-1023,2*-1,8699
     +,16*-1,0/
C
      DATA BITS/10,4,14,8,4*5,9,2,11,10,3,2*11,3,2,11,4*4,2,3*4,7,10
     +,1,5*2,5/
C
C     RPTOFF 0
C       DATA OFFSET/
C    +  64, 74, 78, 92,100,105,110,115,120,129,131,142,152,155,166,177
C    +,180,182,193,197,201,205,209,211,215,219,223,230,240,241,243,245
C    +,247,249,251/
C
C     RPTOFF 1
      DATA OFFSET/
     +   0, 10, 14, 28, 36, 41, 46, 51, 56, 65, 67, 78, 88, 91,102,113
     +,116,118,129,133,137,141,145,147,151,155,159,166,176,177,179,181
     +,183,185,187/
      END
C=======================================================================
```

----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----

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```
      PROGRAM QL28
C-----READ AND PRINT MSTG1 GROUP 3
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE        DESCRIPTION
C      ===== ====== ==========  ====================
C      .01C. SL     85/01/25.   REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=3
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL28',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'S       ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
```

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```
     +1X,'A          ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
     +1X,'Q          ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
     +1X,'R          ',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C======================GROUP 3==========================================
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
     +,1.E-2, 1.E-2, 1.E-2, 0.1
     +,1.E-2, 1.E-2, 1.E-2, 0.1
     +,1., 1., 1., 1.
     +,1.E-2, 1.E-2, 1.E-2, 0.1
     +,2., 2., 2., 2.
     +,0.1, 0.1, 0.1, 0.1
     +,0.2, 0.2, 0.2, 0.2
     +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
     +,-501., -8801., -1., -1.
     +,-501., -8801., -1., -1.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,-.5, -.5, -.5, -.5
     +,-.5, -.5, -.5, -.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C======================================================================

    -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

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```
      PROGRAM QL29
C-----READ AND PRINT MSTG1 GROUP 4
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=4
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL29',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'W       ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
```

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```
     +1X,'U          ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
     +1X,'V          ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
     +1X,'P          ',2F8.2,F8.0,F8.2,F8.0,3F8.1)
      END
C======================GROUP 4==========================================
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
     +,1.E-2, 1.E-2, 1.E-2, 1.E-2
     +,1.E-2, 1.E-2, 1.E-2, 1.E-2
     +,1., 1., 1., 1.
     +,1.E-2, 1.E-2, 1.E-2, 1.E-2
     +,2., 2., 2., 2.
     +,0.1, 0.1, 0.1, 0.1
     +,0.2, 0.2, 0.2, 0.2
     +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
     +,-1., -10221., -10221., 86999.
     +,-1., -10221., -10221., 86999.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,-.5, -.5, -.5, -.5
     +,-.5, -.5, -.5, -.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C=======================================================================
```

----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----

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```
      PROGRAM QL30
C-----READ AND PRINT MSTG1 GROUP 5
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=5
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL30',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C======================================================================
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'C       ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
```

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```
     +1X,'R        ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
     +1X,'W*U      ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
     +1X,'W*V      ',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C======================GROUP 5==========================================
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
     +,0.1, 0.1, 0.1, 0.1
     +,0.1, 0.1, 0.1, 0.1
     +,1., 1., 1., 1.
     +,0.1, 0.1, 0.1, 0.1
     +,2., 2., 2., 2.
     +,0.1, 0.1, 0.1, 0.1
     +,0.2, 0.2, 0.2, 0.2
     +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
     +,-1., -1., -30001., -30001.
     +,-1., -1., -30001., -30001.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,-.5, -.5, -.5, -.5
     +,-.5, -.5, -.5, -.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C======================================================================

    -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

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```
      PROGRAM QL31
C-----READ AND PRINT MSTG1 GROUP 6
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3========4=========5=========6=========7==
C
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     -----------------------------------------------------------------
C
C     ===1=========2=========3========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=6
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL31',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'S-A     ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
```

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```
     +1X,'(S-A)*W ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
     +1X,'QS-Q    ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
     +1X,'(QS-Q)*W',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C======================GROUP 6=========================================
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
     +,1.E-2, 0.1, 1.E-2, 0.1
     +,1.E-2, 0.1, 1.E-2, 0.1
     +,1., 1., 1., 1.
     +,1.E-2, 0.1, 1.E-2, 0.1
     +,2., 2., 2., 2.
     +,0.1, 0.1, 0.1, 0.1
     +,0.2, 0.2, 0.2, 0.2
     +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
     +,-6301., -10001., -4001., -10001.
     +,-6301., -10001., -4001., -10001.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,0., 0., 0., 0.
     +,-1., -1., -1., -1.
     +,-.5, -.5, -.5, -.5
     +,-.5, -.5, -.5, -.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C=====================================================================
```

----- SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN -----

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```
      PROGRAM QL32
C-----READ AND PRINT MSTG1 GROUP 7
C
C-----RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE-DEPENDENT ROUTINES AND FUNCTIONS.  SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR.  BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     ===1=========2=========3=========4=========5=========6=========7==
C
C     -----------REVISION HISTORY---------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01C. SL     85/01/25.  REVISED COMMENTS.
C     ------------------------------------------------------------------
C
C     ===1=========2=========3=========4=========5=========6=========7==
      IMPLICIT INTEGER(A-E,G-Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=-9999.,INDEXCK=5,BPR=384,ID=7
     +,BPW=60,DIM BUF=(1006*64-1)/BPW+1,DIM PK=(BPR-1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C-----2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL32',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C=====================================================================
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1,5)
     +,((FTRUE(5+(J-1)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
     +1X,'U*A     ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
```

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```
     +1X,'V*A       ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
     +1X,'U*Q       ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
     +1X,'V*Q       ',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C======================GROUP 7=========================================
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A-E,G-Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1.,  1.,  1.,  1.
     +,0.1,  0.1,  0.1,  0.1
     +,0.1,  0.1,  0.1,  0.1
     +,1.,  1.,  1.,  1.
     +,0.1,  0.1,  0.1,  0.1
     +,2.,  2.,  2.,  2.
     +,0.1,  0.1,  0.1,  0.1
     +,0.2,  0.2,  0.2,  0.2
     +,0.2,  0.2,  0.2,  0.2/
C
      DATA FBASE/1799.,  0.,  0.,  0.,  0.
     +,-20001.,  -20001.,  -10001.,  -10001.
     +,-20001.,  -20001.,  -10001.,  -10001.
     +,0.,  0.,  0.,  0.
     +,-1.,  -1.,  -1.,  -1.
     +,0.,  0.,  0.,  0.
     +,-1.,  -1.,  -1.,  -1.
     +,-.5, -.5, -.5, -.5
     +,-.5, -.5, -.5, -.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
     +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
     +,144,160,176,192,208,224,240,256,272,288
     +,304,320,324,328,332,336,340,344,348,352
     +,356,360,364,368,372,376,380/
      END
C=====================================================================

   -----  SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN  -----
```

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```
C     CONVERTED BY CONVRT:  TSCON.01B
      PROGRAM RDINV
C
C     *****************************************************************
C
C             PURPOSE -      READ PACKED INVENTORIES FOR PRE-70'S OR
C                            70'S DATA MADE BY PROGRAM DUPELIM
C
C             WRITTEN BY -   JANE HISCOX
C
C     *****************************************************************
C     -----------REVISION HISTORY--------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01B. SL     85/01/30.  REVISED COMMENTS; CONVERT FROM
C                              TIMESHARING FORTRAN.
C     -----------------------------------------------------------------
C
      IMPLICIT INTEGER (A-Z)
      CHARACTER*4 LEVEL
C
      DIMENSION STORE (5000), CARD (50)
C
      COMMON /QC/ INVNF (14,11)
C
      DATA LEVEL /'.01B'/, NSTORE, NSID, NCD, NDS/ 5000, 24, 50, 8/
      DATA RQC, CQC/ 14, 11/, BITBOX, BITYR, BITIOD, BITGT / 10, 8, 15,
     +20/
      DATA IU, JU, OU / 1, 2, 5/
      DATA CARD / 110, 116, 117, 118, 119, 128, 143, 150, 151, 152, 155,
     +            156, 184, 185, 186, 187, 188, 189, 192, 193, 194, 195,
     +            196, 197, 281, 555, 666, 849, 850, 876, 877, 878, 879,
     +            880, 881, 882, 888, 889, 891, 897, 898, 899, 900, 901,
     +            902, 926, 927, 928, 999, 50/
C
      REWIND IU
      REWIND JU
      REWIND OU
C
      DTE = DATE (K)
      TME = TIME (K)
      READ (JU,*,END=900) BOX
      WRITE (5,5) BOX, LEVEL, DTE, TME
    5 FORMAT ('1 INVENTORIES FOR BOX ',I3,T60,'BY RDINV',A,2X,2A10)
C
  100 BUFFER IN (IU,0) (STORE(1), STORE(NSTORE))
      IF (UNIT(IU) .LT. 0) THEN
          OFF = 0
          NWORD = 1
          CALL GBYTE (STORE(NWORD), BOX10, OFF, BITBOX)
          IF (BOX10 .EQ. BOX) THEN
              OFF = OFFSET (OFF,NWORD,BITBOX)
  175         CALL GBYTE (STORE(NWORD), YEAR, OFF, BITYR)
              OFF = OFFSET (OFF,NWORD,BITYR)
              IF (YEAR .NE. 0) THEN
                  YEAR = YEAR + 1799
```

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```
                    WRITE (5,200) YEAR
  200               FORMAT (//' YEAR = ',I4,/1X,
     +                 'MO.    IN   OUT  UNCERTAIN', /1X,26('='))
                    SUMI = 0
                    SUMO = 0
                    SUMD = 0
                    DO 225 MO = 1,12
                       CALL GETNUM (STORE, IMO, OFF, NWORD, BITIOD)
                       CALL GETNUM (STORE, OMO, OFF, NWORD, BITIOD)
                       CALL GETNUM (STORE, DMO, OFF, NWORD, BITIOD)
                       IF (IMO .NE. 0) WRITE (5,210) MO, IMO, OMO, DMO
  210                  FORMAT (1X,I2,1X,2I6,3X,I6)
                       SUMI = SUMI + IMO
                       SUMO = SUMO + OMO
                       SUMD = SUMD + DMO
  225               CONTINUE
                    WRITE (5,250) SUMI, SUMO, SUMD
  250               FORMAT (1X,26('=')/4X,2I6,3X,I6)
C
C      -----------UNPACK YEARLY TOTALS FOR SOURCE IDS
                    WRITE (5,260)
  260               FORMAT (//' TOTALS BY SID',/
     +                 1X,'SID       IN       OUT    UNCERTAIN',/1X,
     +                 36('='))
                    SUMI = 0
                    SUMO = 0
                    SUMD = 0
                    DO 300 JR = 1,NSID
                       CALL GETNUM (STORE, ISID, OFF, NWORD, BITIOD)
                       CALL GETNUM (STORE, OSID, OFF, NWORD, BITIOD)
                       CALL GETNUM (STORE, DSID, OFF, NWORD, BITIOD)
                       IF (ISID .NE. 0) WRITE (5,275) JR, ISID, OSID, DSID
  275                  FORMAT (1X,I3,3(3X,I7))
                       SUMI = SUMI + ISID
                       SUMO = SUMO + OSID
                       SUMD = SUMD + DSID
  300               CONTINUE
                    WRITE (5,325) SUMI, SUMO, SUMD
  325               FORMAT (1X,36('='),/4X,3(3X,I7))
                    GO TO 175
                 ENDIF
C
C      -----------UNPACK GRAND TOTALS BY SID
                 WRITE (5,350) BOX10
  350            FORMAT ('1 GRAND TOTALS FOR BOX ',I3,//
     +              1X,' SID       IN       OUT  UNCERTAIN',/1X,
     +              36('='))
                 SUMI = 0
                 SUMO = 0
                 SUMD = 0
                 DO 400 JR = 1,NSID
                    CALL GETNUM (STORE, ISID, OFF, NWORD, BITGT)
                    CALL GETNUM (STORE, OSID, OFF, NWORD, BITGT)
                    CALL GETNUM (STORE, DSID, OFF, NWORD, BITGT)
                    IF (ISID .NE. 0) WRITE (5,275) JR, ISID, OSID, DSID
                    SUMI = SUMI + ISID
```

```
                 SUMO = SUMO + OSID
                 SUMD = SUMD + DSID
  400         CONTINUE
              WRITE (5,325) SUMI, SUMO, SUMD
C
C     -----------UNPACK GRAND TOTALS BY CARD DECK
              WRITE (5,500)
  500         FORMAT (///,1X,' CD        IN       OUT  UNCERTAIN',/1X,
     +                36('='))
              SUMI = 0
              SUMO = 0
              SUMD = 0
              DO 600 JR = 1,NCD
                 CALL GETNUM (STORE, ICD, OFF, NWORD, BITGT)
                 CALL GETNUM (STORE, OCD, OFF, NWORD, BITGT)
                 CALL GETNUM (STORE, DCD, OFF, NWORD, BITGT)
                 IF (ICD .NE. 0) WRITE (5,275) CARD(JR), ICD, OCD, DCD
                 SUMI = SUMI + ICD
                 SUMO = SUMO + OCD
                 SUMD = SUMD + DCD
  600        CONTINUE
             WRITE (5,325) SUMI, SUMO, SUMD
C
C     -----------UNPACK GRAND TOTALS
             WRITE (5,625)
  625        FORMAT (///' GRAND TOTALS')
             CALL GETNUM (STORE, IGT, OFF, NWORD, BITGT)
             CALL GETNUM (STORE, OGT, OFF, NWORD, BITGT)
             CALL GETNUM (STORE, DGT, OFF, NWORD, BITGT)
             WRITE (5,650) IGT, OGT, DGT
  650        FORMAT (/' TOTAL IN = ',I7,',  TOTAL OUT = ',I7,
     +               ',  NUMBER OF UNCERTAIN IN OUT = ',I7)
C
C     -----------UNPACK TOTALS BY DS
             WRITE (5,675)
  675        FORMAT (///' TOTALS BY DUPLICATE STATUS',//5X,
     +               ' DS  TOTAL',/5X,12('='))
             SUMDS = 0
             DO 700 JR = 1,NDS
                CALL GETNUM (STORE, ODS, OFF, NWORD, BITGT)
                J = JR - 1
                WRITE (5,685) J, ODS
  685           FORMAT (5X,I3,I7)
                SUMDS = SUMDS + ODS
  700        CONTINUE
             WRITE (5,725) SUMDS
  725        FORMAT (5X,12('='),/8X,I7)
C
C     -----------UNPACK QC INVENTORIES
             DO 800 JC = 1,CQC
                DO 775 JR = 1,RQC
                   CALL GETNUM (STORE, INVNF(JR,JC), OFF, NWORD, BITGT)
  775           CONTINUE
  800        CONTINUE
C            CALL PRINVN (BOX10)
             GO TO 900
```

```
            ENDIF
            GO TO 100
         ENDIF
  900    REWIND IU
         REWIND JU
         REWIND OU
         END
C
C        ******************************************************************
C
         SUBROUTINE GETNUM (STORE, NUM, OFF, NWORD, BITS)
C
C        -----------UNPACK NUMBER, UPDATE OFFSET.  IF THE UNPACKED NUMBER
C                   IS THE MAXIMUM SIZE FOR NUMBER OF BITS, UNPACK THE NEXT
C                   NUMBER AND SUM THEM.
C                       STORE    - ARRAY TO UNPACK NUMBER FROM
C                       NUM      - RESULTANT NUMBER
C                       OFF      - OFFSET
C                       NWORD    - WORD OF ARRAY STORE TO UNPACK FROM
C                       BITS     - NUMBER OF BITS TO UNPACK FROM STORE
C
         IMPLICIT INTEGER (A-Z)
C
         DIMENSION STORE (*)
C
         NUM = 0
  100    CALL GBYTE (STORE(NWORD), N, OFF, BITS)
         OFF = OFFSET (OFF, NWORD, BITS)
         NUM = NUM + N
         IF (N .GE. (2**BITS - 1)) GO TO 100
         END
C
C        ******************************************************************
C
         INTEGER FUNCTION OFFSET (OFF, NWORD, BITS)
C
C        -----------UPDATE OFFSET AND NWORD BY BITS
C
         IMPLICIT INTEGER (A-Z)
         DATA WRDSIZ / 60/
C
         OFFSET = OFF + BITS
         IF (OFFSET .GE. WRDSIZ) THEN
            OFFSET = OFFSET - WRDSIZ
            NWORD = NWORD + 1
         ENDIF
         END
C
C        ******************************************************************
C
         SUBROUTINE PRINVN (BOX10)
C
C        -----------PRINT QC INVENTORIES
C
         IMPLICIT INTEGER (A-Z)
         CHARACTER FLAG (14)*8
```

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```
C
      COMMON /QC/ INVNF (14,11)
C
      DATA FLAG /'SHIP POS','WIND    ','VIS     ','PRES WX ','PAST WX ',
     +           'PRESSURE','DRY BULB','WET BULB','DEW PT  ','SEA TEMP',
     +           'CLOUDS  ','WAVES   ','SWELLS  ','P TEND  '/
C
      WRITE (5,10) BOX10
   10 FORMAT (///,' QUALITY CONTROL FLAGS, BOX10 = ',I3,
     +          /1X,'FLAG/VALUE',3X,'MISSING',7X,'R',9X,'A',9X,'B',9X,
     +          'J',9X,'K',9X,'L',9X,'M',9X,'N',9X,'Q',9X,'S',5X,
     +          'TOTAL')
      DO 230 JR = 1,14
         TOTAL = 0
         DO 220 JC = 1,11
            TOTAL = TOTAL + INVNF(JR,JC)
  220 CONTINUE
         WRITE (5,225) FLAG(JR),(INVNF(JR,JC),JC=1,11),TOTAL
  225 FORMAT (1X,A,12I10)
  230 CONTINUE
      END
```

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```
C     CONVERTED BY CONVRT:  TSCON.01B
      SUBROUTINE READER(UNIT,TARGET)
C     -----------READ LANDLOCKED BOX2 MAP INTO @TARGET(16202)
C                FROM INTEGER &UNIT.
C                     1H. = LAND
C                     1H* = COASTAL
C                     1H  = SEA
C     -----------REVISION HISTORY-------------------------------------
C      LEVEL AUTHOR DATE       DESCRIPTION
C      ===== ====== ========== ====================
C      .01A. SDW    85/02/15.  ORIGINAL VERSION TAKEN FROM LLLIBS.01J.
C      .01B. SL     85/02/15.  REPLACE ALL R1 FORMAT DESCRIPTORS WITH
C                              A1.  REMOVE CONVERT TO INTEGER ENTRY.
C                              REMOVE ALL END= FROM READ STATEMENTS.
C                              REVISED COMMENTS.  CONVERT FROM
C                              TIMESHARING FORTRAN.
C     ----------------------------------------------------------------
      IMPLICIT INTEGER(A-E,G-Z)
      DIMENSION TARGET(16202)
C     -----------READ, @TARGET WILL REMAIN IN A1 WITH NO CONVERSION
      READ(UNIT,100) TARGET(1)
  100 FORMAT(///,6X,A1)
      DO 300 KLAT=1,90
        KLON1=(KLAT-1)*180+2
        KLON2=KLON1+89
        READ(UNIT,200)  (TARGET(I),I=KLON1,KLON2)
  200   FORMAT(6X,90A1)
  300 CONTINUE
      READ(UNIT,350)
  350 FORMAT(3(/))
      DO 500 KLAT=1,90
        KLON1=(KLAT-1)*180+92
        KLON2=KLON1+89
        READ(UNIT,200)  (TARGET(I),I=KLON1,KLON2)
  500 CONTINUE
      READ(UNIT,600)  TARGET(16202)
  600 FORMAT(95X,A1)
      END
```

Same as program above but in text form
(tabs instead of spaces – no guarantee as to accuracy)

```
	PROGRAM TEST
	CHARACTER*10 LEVEL*6,DTE,TME
	INTEGER UNIT
	DATA LEVEL/'.01J
	CALL DATE(DTE)
	CALL TIME(TME)
	PRINT 1,LEVEL,DTETME
	1 FORMAT('1BXPORT) 03A)
	WRITE(UNIT,1) LEVEL,DTE,TME
	RETURN
	END
C
C	BXPORT, SOURCE CODE FOR BOXLIB
C	A LIBRARY OF TOOLS FOR USING BOXES AND OTHER GLOBAL
C	GRID SYSTEMS, E.G. MARSDEN SQUARES. THE BOX SYSTEMS ARE:
C	GENERIC NAME SPECIFIC NAME POLAR BOXES X–ORIGIN

C	BOX2 BX16 202 YES 0E
C	BOX4 BX4052 YES 0E
C	BOX10 BX648 NO 30E
C
C
C	1 2 3 4 5 6 7
C	REVISION HISTORY
C	LEVEL AUTHOR DATE DESCRIPTION
C
C	01A. 83/07/20. ORIGINAL VERSION TAKEN QL1BS.01I VIA F45
C	.01B. SDW 83/07/21. UPDATES BOX10 TOOLS TO CURRENT SYSTEM
C	.01C. SDW 84/05/02. FIX ERROR IN <XYBQ>, COMMENT OUT <XYMSQ>,
C	AND ADD <B1026>.
C	.01D. TSP 84/10/05. FIXED <BLOXYO> TO ADJUST FOR 30 DEGREE
C	SHIFT OF BIO SYSTEM
C	.01E. TSP 84/10/08. FIXED ERRORS IN <MSQB1O)
C	.01F. TSP 84/10/08. FIXED <XYMSQ> AND <MSQXYO)
C	.01G. TSP 84/10/09. DELETED <B25> AND <B52>, TRIMMED ALL
C	 LINES TO 72 CHARACTERS MAXIMUM
C	.01H. TSP 84/10/09. DELETED <B5XYO>, <MSQ5>, AND <XYB5>
C	.01I. TSP 84/10/10. CHANGED NAMES OF SOURCE AND
C	OBJECT CODE.
C	.01J. TSP 84/10/15. DELETED BOX5 AND AUTHOR COMMENT LINES.
C
C	1 2 3 4 5 6 7
	INTEGER FUNCTION BLOMSQ(MSQ)
C	EQUALS –1 IF ILLEGAL MSQ ELSE EQUALS EQUIVALENT B10
	IMPLICIT INTEGER(A–Z)
	IF(MSQ.GE.1.AND.MSQ.LE.288)THEN
	SQR MSQ+35
	ELSE IF(MSQ.GE.300.AND.MSQ.LE.623)THEN
	SQR=–1*(MSQ–300)
	ELSE IF(MSQ.GE.901.AND.MSQ.LE.936)THEN
	SQR=MSQ–577
	ELSE
	GOTO 900
	ENDIF
	B10MSQ=(g–SQR/36)*36 +(71–MOD(IABS(SQR),36))
	+–(71–MOD(IABS(SQR),36))/39*36 –2
```

```
        RETURN
900     B10MSQ=–1
        RETURN
        END
C       1       2     3      4      5      6       7
        LOGICAL FUNCTION B1026(B2,B26,810)
C       FALSE IF 1>0B10648, ELSE TRUE SLXH THAT OB2 CONTAINS
C       THE 25 BOX2 CONTAINED BY BOX10 OB10 IN NUMERICAL ORDER,
C       AND OB26 CONTAINS ZERO OR THE 26TH BOX2 FOR THE POLAR
C       BOX10.
        IMPLICIT INTEGER(A–Z)
        LOGICAL XYB10,B2XYO
        DIMENSION B2(25)
        JB=B26=0
        B1026=.FALSE.
        IF(.NOT.XYB10(X1,Y2,B10)) RETURN
        X2=X1+80
        Y1=Y2+80
        DO 500 Y=Y1,Y2,–20
        DO 500 X=Xl,X2, 20
        IF(.NOT.B2XYO(X,Y,BOX2)) RETURN
        JB=JB+L
        B2(JB)=BOX2
        500CONTINUE
        IF(BlO.EQ. 1) B26= 1
        IF(BIO.EQ.648) B26=16202
        B1026=.TRUE.
        RETURN
        END
C       1       2     3      4      5      6       7
        LOGICAL FUNCTION BIOXYO(X,Y,B10)
C       PERFORM <BQXYO> ON 10 DEGREE BOX CORNER OX,OY
        IMPLICIT INTEGER(A–E,G–Z)
        LOGICAL BQXYO
        DATA Q/100/,XDIM/36/,Y1/800/,YMOVE/8/,X2/3500/
C       SHIFT LATITUDE X 30 DEGREES WEST TO COMPUTE USING BQXYO
        IF (X GE. 300) THEN
        XS=X–300
        ELSE
        XS=X+3300
        ENDIF
        B10XYO=BQXY0(XS,Y,B10,Q,XDIM,Y1,YMOVE,X2)
C       SUBTRACT 1 FROM BOX # TO ADJUST FOR LACK OF NORTH POLAR BOX
        B10=B1010–1
        RETURN
        END
C       1       2     3      4      5      6       7
C       *F45V1P0*
        LOGICAL FUNCTION B2XYO(X,Y,B2)
C       PERFORM <BQXYO> ON 2 DEGREE BOX CORNER OX,OY
        IMPLICIT INTEGER(A–E,G–Z)
        LOGICAL BQXYO
        DATA Q/20/,XDIM/180/,YI/880/,YMOVE/44/,X2/3580/
        B2XYO=BQXY0(X,Y,B2,Q,XDIM,Y1,YMOVE,X2)
        RETURN
        END
```

```
C     1       2      3       4       5       6       7
C     *F45V1P0*
      LOGICAL FUNCTION B4XYO(X,Y,B4)
C     FALSE IF OX,OY ARE NOT THE LOWER–LEFT (SW) CORNER OF A
C     OQ/10 DEGREE BOX IN 10THS DEGREE +N,–S,E.
C     ELSE TRUE RETURNING THE BOX NUMBER OB4
C     WHERE CXDIM IS THE NUMBER OF BOXES PER LAT ZONE
C     0Y1 IS 900–OQ
C     OX2 IS THE LARGEST X
C
C     WARNING – DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C     (B4XYO) CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C     CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C     –85 TO –90 DEGREE LATITUDE BAND HAVE (OX,*Y)=(O,–900)
C     AS THEIR SOUTHWEST CORNER. THUS (B4XYO> CANNOT TELL
C     WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,–900).
C
C     <B4XYO> RETURNS FALSE. FOR NORTH POLAR BOX.
C     RETURNS TRUE. FOR SOUTH POLAR BOX; BUT
C     THE RETURNED BOX IS NOT THE SOUTH POLAR
C     BOX.
C
      IMPLICIT INTEGER(A–E,G–Z)
      DATA Q/40/,XDIM/90/,Yl/860/,X2/3560/
      IF(MOD(X,Q).EQ.O.AND.MOD(900–Y,Q).EQ.O.AND.
      + (X.GE.O.AND.X.LE,X2) AND.
      + (Y.GE.–900.AND.Y.LE.Yi)) GOTO 200
      B4XYO=.FALSE.
      RETURN
      200 B4=((900–Y)/Q–1)*XDIM+X/Q+2
      B4XYO=.TRUE.
      RETURN
      END
C     1       2      3       4       5       6       7
C     *F45V1P0*
      LOGICAL FUNCTION BQXYO(X,Y,BQ,Q,XDIM,Y1,YMOVE,X2)
C     FALSE IF OX,OY ARE NOT THE LOWER–LEFT (SW) CORNER OF A OQ/10
C     DEGREE BOX IN 10THS DEGREE +N,–S,E; EXCLUDING POLAR BOXES
C     ELSE TRUE RETURNING THE BOX NUMBER CBQ
C     WHERE GXDIM IS THE NUMBER OF BOXES PER LAT ZONE
C     OYI is 900–OQ
C     OYMOVE IS (900/OQ)–l
C     OX2 IS THE LARGEST X
C
C     WARNING – DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C     <BQXYO> CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C     CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C     –85 TO –90 DEGREE LATITUDE BAND HAVE (OX,CY)=(O,–900)
C     AS THEIR SOUTHWEST CORNER. THUS <BQXYO> CANNOT TELL
C     WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,–900).
C
C     <BQXYO>RETURNS FALSE. FOR NORTH POLAR BOX.
C     RETURNS TRUE. FOR SOUTH POLAR BOX; BUT
C     THE RETURNED BOX IS NOT THE SOUTH POLAR
C     BOX.
C
```

```
      IMPLICIT INTEGER(A–E,G–Z)
      IF(MOD(X,Q).EQ.O.AND.MOD(Y,Q).EQ.O.AND.
      +(X.GE.O.AND.X.LE.X2) AND.
      +(Y.GE.–900.AND.Y.LE.Yi)) GOTO 200
      BQXYO= .FALSE.
      RETURN
      200 BQ=(YMOVE–Y/Q)*XDIM+X/Q+2
      BQXYO=.TRUE.
      RETURN
C     THIS PROGRAM VALID ON FTN4 AND FTN5
      END
C     1         2         3         4         5         6         7
      INTEGER FUNCTION MSQB10(BIO)
C     EQUALS –1 IF ILLEGAL B10, ELSE EQUALS EQUIVALENT MSQ
      IMPLICIT INTEGER(A–E,G–Z)
      MSQB10=–L
      M=MOD(B10,36)
      IF (M EQ. 0) M=36
      IF (B10 GE. 1 AND. B10 LE. 33) THEN
      MSQB10 = 934–B10
      ELSE
      MSQB10 = 970–810
      ENDIF
      IF (B10 GE. 37 AND. B10 LE. 324) THEN
      IF (M GE. 1 AND. M.LE. 33) THEN
      MSQB10 = 322–B10
      ELSE
      MSQB10 = 358–B10
      ENDIF
      ENDIF
      IF (B10 GE. 325 AND. B10 LE. 648) THEN
      IF (M GE. 1 AND. M LE. 33) THEN
      MSQB10 = 333–M+((AINT(BlO/36.0)–9)*36)
      ELSE IF (M EQ. 34 OR. M EQ. 35) THEN
      MSQB10 = 369–M+((AINT(BlO/36.0)–9)*36)
      ELSE IF (M EQ. 36) THEN
      MSQB10 = 333+((AINT(BlO/36.0)–10)*36)
      ENDIF
      ENDIF
      RETURN
      END
C     1         2         3         4         5         6         7
C     *F45V1P0
      LOGICAL FUNCTION MSRXYO(X,Y,MSQ)
C     RETURNS MSQ BOX # OMSQ GIVEN 10 DEGREE BOX CORNER OX, OY
C     RETURNS FALSE IF OX,OY IS NOT THE CORNER OF A 10 DEGREE
C     BOX.
C
C     (MSQXYO> USES <BQXYO> – SEE WARNING BELOW.
C
C     WARNING – DO NOT USE THIS FUNCTION FOR THE POLAR BOXES.
C     <BQXYO> CANNOT RECOGNIZE (0,900) AS THE SOUTHWEST
C     CORNER OF THE NORTH POLAR BOX, AND ALL BOXES IN THE
C     –85 TO –90 DEGREE LATITUDE BAND HAVE (OX,QY)=(O,–900)
C     AS THEIR SOUTHWEST CORNER. THUS (BQXYO> CANNOT TELL
C     WHICH BOX IS THE SOUTH POLAR BOX WHEN GIVEN (0,–900).
```

```
C
C          <BQXYO> RETURNS FALSE. FOR NORTH POLAR BOX.
C          RETURNS TRUE. FOR SOUTH POLAR BOX; BUT
C          THE RETURNED BOX IS NOT THE SOUTH POLAR
C          BOX.
C
           IMPLICIT INTECER(A–E,G–Z)
           LOGICAL BQXYO
C          SHIFT LATITUDE X 30 DEGREES WEST TO COMPUTE USING BQXYO
           IF (X GE. 300) THEN
           XS=X–300
           ELSE
           XS=X+3300
           ENDIF
           DATA R/100/,XDIM/36/,Yl/800/,YMOVE/8/,X2/3500/
           MSQXYO=BQXYO(XS,Y,BQ,Q,XDIM,Y1,YMOVE,X2)
C          SUBTRACT 1 FROM BOX # TO ADJUST FOR LACK OF POLAR BOX AND
C          RECALCULATE THE EQUIVALENT MARSDEN SQUARE
           MSQ=MSQBIO(BQ–1)
           RETURN
           END
C          1       2     3      4      5      6       7
           INTEGER FUNCTION QCDCXY(X,Y)
C          RETURNS –1 UNLESS 900<OY<–900, 3599<QX<0, OX<>1800 (10THS E)
C          RETURNS THE NCDC QUADRANT 1=NW,2=NE,3=SW,4=SE OTHERWISE
           IMPLICIT INTEGER(A–E,G–Z)
           IF(Y.LT.900.AND.Y.GT.–900.AND.X.LT.3599.AND.X.GT.O.AND.X.NE.1800)
           +THEN
           QCDCXY=L
           IF(X.LT.1800) QCDCXY=QCDCXY+L
           IF(Y.LT.0) QCDCXY=QCDCXY+2
           ELSE
           QCDCXY=–L
           ENDIF
           RETURN
           END
C          1       2     3      4      5      6       7
           LOGICAL FUNCTION XYB10(X,Y,B10)
C          PERFORM <XYBQ> ON A 10 DEGREE BOX OB10
           IMPLICIT INTEGER(A–E,G–Z)
           LOGICAL XYBQ
           DATA Q/100/,LAST/648/,XDIM/36/,Yl/800/,POLE/1/,XMOVE/300/
           XYB10=XYBQ(X,Y,BlO,Q,LAST,XDIM,Y1,POLE,XMOVE)
           RETURN
           END
C          1       2     3      4      5      6       7
C          *F45V1P0*
           LOGICAL FUNCTION XYB2(X,Y,B2)
C          PERFORM <XYBQ> ON A 2 DEGREE BOX OB2
           IMPLICIT INTEGER(A–E,G–Z)
           LOGICAL XYBQ
           DATA Q/20/,LAST/16202/,XDIM/180/,Y1/880/,POLE/2/,XMOVE/0/
           XYB2=XYBQ(X,Y,B2,Q,LAST,XDIM,Y1,POLE,XMOVE)
           RETURN
           END
C          1       2     3      4      5      6       7
```

```
C       *F45V1P0*
        LOGICAL FUNCTION XYB4(X,Y,B4)
C       PERFORM <XYBQ> ON A 4 DEGREE BOX OB4
        IMPLICIT INTEGER(A–E,G–Z)
        LOGICAL XYBQ
        DATA Q/40/,LAST/4052/,XDIM/90/,Yl/860/,POLE/2/,XMOVE/O/
        XYB4=XYBQ(X,Y,B4,Q,LAST,XDIM,Y1,POLE,XMQVE)
        RETURN
        END
C       1       2     3     4     5     6     7
C       *F45V1P0*
        LOGICAL FUNCTION XYBQ(X,Y,BQ,Q,LAST,XDIM,Y1,POLE,XMOVE)
C       FALSE IF 1>BQ>OLAST, ELSE TRUE SUCH THAT OX,OY ARE THE
C       LAT,LON IN 10THS DEGREE +N,–S,E OF LOWER–LEFT (SW) CORNER
C       OF OR/10 DEGREE BOX GBQ; POLAR *X ARE SET TO 0
C       WHERE OLAST IS THE LAST BOX NUMBER
C       OXDIM IS THE NUMBER OF BOXES PER LAT ZONE
C       OY1 is 900–QQ
C       OPOLE IS 1 IF 0 POLAR BOXES, 2 IF 2 POLAR BOXES
C       OXMOVE IS THE X–ORIGIN
        IMPLICIT INTEGER(A–E,G–Z)
        XYBQ=.FALSE.
        IF(BQ.LT.1.DR.BR.GT.LAST) RETURN
        IF(POLE.EQ.1) GOTO 200
        IF(BQ.NE.1) GOTO 100
        X=0
        Y=900
        GOTO 900
100     IF(BR.NE.LAST) GOTO 200
        X=0
        Y=–900
        GOTO 900
200     CONTINUE
        X=MOD(BQ–POLE,XDIM)*Q+XMOVE
        IF(X.GE.3600) X=X–3600
        Y=Y1–(BQ–POLE)/XDIM*Q
        900 XYBQ=.TRUE.
        RETURN
C       THIS PROGRAM VALID ON FTN4 AND FTN5
        END
C       1       2     3     4     5     6     7
        LOGICAL FUNCTION XYMSQ(X,Y,MSQ)
C       PERFORM <BLOMSQ> TO CONVERT OMSQ TO OB10, THEN USES
C       <XYBQ> TO FIND LAT. AND LONG. OF EQUIVALENT OB10
        IMPLICIT INTEGER(A–E,G–Z)
        LOGICAL XYBQ
        B10 = BLOMSQ(MSQ)
        DATA Q/100/,LAST/648/,XDIM/36/,Y1/800/,POLE/1/,XMOVE/300/
        XYMSQ=XYBQ(X,Y,B10,Q,LAST,XDIM,Y1,POLE,XMOVE)
        RETURN
        END
```

```
      PROGRAM Q19
C     READ AND PRINT MSU2
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NLNBER OF BITS PER MACHINE
C     WORD.
C     1      2    3     4     5     6      7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR    DATE   DESCRIPTION
C
C     .01G.   SL   85/01/24.    REVISED COMMENTS.
C
C
C     1      2    3     4     5     6      7
C     IMPLICIT INTEGER(A–E,G–Z)
C
C
      PARAMETER(MAX=100,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=1600,ID=0
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=117)

C     COMMON /MSU2/FUNITS(117),FBASE(117),BITS(117),OFFSET(117)

C     DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(8,14)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C     DATA LEVEL/4H.01G/,BUF/DIM BUF*O/
C     CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI9',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.O)GOTO 900
C
C     PRINT 300,FTRUE
300   FORMAT(/' YEAR F5.0, 'MONTH', F3.0,' BOX2 ',F6.0,' BOX10, F4.0
      +,' CHECKSUM )JF6.0/
      +8X,'S',7X,'A', 7X,'W',7X,'U',7X,'V',7X,'P',7X,'C',7X,'Q'/
      +1X,'D',8F8.1/
      +1X,'H',8F8.1/
      +1X,'X',8F8.2/
      +1X,'Y',8F8.2/
      +1X,'N',8F8.0/
      +1X,'M',8F8.2,F8.1,F8.2/
      +1X,'S',8F8.2,F8.1,F8.2/
      +1X,'0',8F8.2,F8.1,F8.2/
      +1X,'1',8F8.2,F8.1,F8.2/
      +1X,'2',8F8.2,F8.1,F8.2/
      +1X,'3',8F8.2,F8.1,F8.2/
```

```
      +1X,'4',6F8.2,F8.1,F8.2/
      +1X,'5',6F8.2,F8.1,F8.2/
      +1X,'6',6F8.2,F8.1,F8.2)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C
      BLOCK DATA MSU2
      IMPLICIT INTEGER(A–E,G–Z)
      COMMON /MSU2/FUNITS(117),FBASE(117),BITS(117),OFFSET(117)
C
      DATA FUNITS/5*1.
      +,8*.2,8*.1,16*.01,8*1.
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01
      +,6*.01,.1,.01/
C
      DATA FBASE/1799,4–0
      +,8*4,24*–1,8*0,–501,–8801,–1,2*–10221,86999,2*–1,8*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1
      +,–501,–8801,–1,2*–10221,86999,2*–1/
C
C     DATA BITS/8,4,14,10,12,32*8,80*16/
C
      DATA OFFSET/
      +, 16, 24, 28, 42, 52, 64, 72, 80, 88, 96, 104, 112, 120
      +, 128, 136, 144, 152, 160, 168, 176, 184, 192, 200, 208, 216, 224
      +, 232, 240, 248, 256, 264, 272, 280, 288, 296, 304, 312, 320, 336
      +, 352, 368, 384, 400, 416, 432, 448, 464, 480, 496, 512, 528, 544
      +, 560, 576, 592, 608, 624, 640, 656, 672, 688, 704, 720, 736, 752
      +, 768, 784, 800, 816, 832, 848, 864, 880, 896, 912, 928, 944, 960
      +, 976, 992,1008,1024,1040,1056,1072,1088,1104,1120,1136,1162,1168
      +, 1184,1200,1216,1232,1248,1264,1280,1296,1312,1328,1344,1360,1376
      +,  1392,1408,1424,1440,1456,1472,1488,1504,1520,1536,1652,1568,1584/
      END
C
      SUBROUTINE GETRPT(TAPE,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
C
C     RETURN FLOATING POINT VALUES IN FTRUE
C
C     INPUT
      TAPE RPTIN/RCDIN UNIT
C     FMISS MISSING VALUE
```

```
C           FUNITS(DIM UN) – UNITS FOR UNCODING
C           FBASE(DIM UN) – BASE FOR UNCODING
C           BITS(DIM UN) – BITS FOR UNPACKING
C           OFFSET(DIM UN) – OFFSET FOR UNPACKING
            INDEXCK – UN(INDEXCK) = CHECKSUM
C           ID GROUP NUMBER FOR IDENTIFICATION CHECKSUM
C           BPR – BITS PER REPORT
C           BPW – BITS PER WORD
C           RPTOFF – 0=FALSE 1=TRUE
C           OUTPUT
C           BUF(DIM BUF) – RPTIN/RCDIN BUFFER
C           PK (DIM PK) – PACKED REPORT
C           UN(DIM UN) – UNPACKED REPORT
C           FTRUE(DIM UN) – TRUE VALUES
C           JEOF – 0=FALSE 1=TRUE
C
            IMPLICIT INTEGER(A–E,G–Z)
            DIMENSION FUNITS(DIM UN),FBASE(DIM UN),BITS(DIM UN),OFFSET(DIM UN)
            +,BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C           RPTIN/RCDIN

            IF(RPTOFF.NE.0)GOTO 100
            CALL RPTIN(TAPE,BUF,PK,KWDS,1,DIM PK,JEOF)
            GOTO 110
100         CALL RCDIN(TAPE,BUF,DIM BUF,PK,DIM PK,BPR,BPW,JEOF)
110         IF(JEOF–1)200,900,800
C
C           GBYTE AND CONVERT TO TRUE
200         CK=ID
            DO 230 I=1,DIM UN
            CALL GBYTE(PK(OFFSET(I)/BPW+1),UN(I),MOD(OFFSET(I),BPW),BITS(I))
            IF(I.EQ.INDEXCK)GOTO 210
            IFTRUE(I).EQ.0)GOTO 220
            IFTRUE(I)=(UN(I)+FBASE(I))*FUNITS(I)
            F(I)=(UN(I)+FBASE(I))*FUNITS(I)
            CK=CK+UN(I)
            GOTO 230
210         FTRUE(INDEXCK)=UN(INDEXCK)
            GOTO 230
220         FTRUE(I)=FMISS
230         CONTINUE
            IF(MOD(CK,2**BITS(INDEXCK)–1).EQ.UN(INDEXCK))RETURN
C
C           ERROR
            PRINT *,' SUBROUTINE GETRPT CHECKSLUM ERROR, TAPE ',TAPE
            +,' , REPORT = ',BUF(2)
            PRINT *,' FTRUE = ',FTRUE
800         STOP
C
900         END
C
            SUBROUTINE RCDIN(TAPE,BUF,DIM BUF,RCD,DIM RCD,BPR,BPW,JEOF)
C
C           RETURN ONE LOGICAL RECORD IN RCD
C
C           INPUT
C           TAPE – BUFFER IN UNIT
```

```
C       BPR – BITS PER RECORD
C       BPW – BITS PER WORD
C       OUTPUT
C       BUF(DIM BUF) – PHYSICAL RECORD
C       RCD(DIM RCD) – LOGICAL RECORD
C       JEOF – 0—FALSE 1=TRUE
C
C       BUF(1) = GBYTE OFFSET
C       BUF(2) = LOGICAL RECORD COUNT
C       BUF(3) = PHYSICAL RECORD COUNT
C       BUF(4) =
C       BUF(5) = BLOCK LENGTH IN BITS
C       BUF(6) =
C
C       IMPLICIT INTEGER(A–E,G–Z)
        REAL UNIT
C       DIMENSION BUF(DIM BUF),RCD(DIM RCD)
        IF(BUF(I)+BPR.LE–BUF(5))GOTO 200
C       BUFFER IN
10      BUFFER IN(TAPE,1)(BUF(7),BUF(DIM BUF)) JEOF=UNIT(TAPE)+1 IF(JEOF–1)100,100,800
100     BUF(1)=0
        BUF(5)=LENGTH(TAPE)*BPW
        IF(JEOF.EQ.1)RETURN
        BUF (3) =BUF (3) +1
C
C       GBYTE
200     CALL GBYTES
        +(BUF(6+BUF(1)/BPW+J) RCD MOD(BUF(1),BPW) BPW 0 DIM RCD)
        IF(RCD(1).EQ.O.AND.RCD(2).EQ.0)GOTO 10
        BUF (1) =BUF (1) +BPR
        BUF(2)=BUF(2)+1
        RETURN
C
C       ERROR
800     PRINT *,’ SUBROUTINE RCDIN BUFFER IN ERROR, TAPE ’,TAPE +,’, BLOCK = ’,BUF(3)+l
        STOP
        END
```

```
      PROGRAM QI12
C     READ AND PRINT CMR4
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1      2     3     4     5     6      7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR      DATE  DESCRIPTION
C
C     .01D.SL  85/01/25.    REVISED    COMMENTS.
C
C     1      2     3     5     6     7
C     IMPLICIT INTEGER(A–E,G–Z)
C
C     PARAMETER(MAX=300,RPTOFF=1,FMISS=–999.9,INDEXCK=30,BPR=192,ID=0
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=30)

      COMMON /CMR4/FIELD(30),FTRUEL(30),FTRUEU(30),FUNITS(30)
      +,FBASE(30),BITS(30),OFFSET(30)

C     DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     DATA LEVEL/4H.01D/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI12',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
C     PRINT 300,(FIELD(I),FTRUE(I),I=1,DIM UN)
300   FORMAT(6(1X,A5,F7.1))
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END

      BLOCK DATA CMR4
      IMPLICIT INTEGER(A–E,G–Z)

      COMMON /CMR4/FIELD(30),FTRUEL(30),FTRUEU(30),FUNITS(30)
      +,FBASE(30),BITS(30),OFFSET(30)
C
C     DATA FIELD/
      +8HBOX10    ,8HMONTH    ,8HBOX2      ,8HYEAR                          ,8HDAY
,
      +8HHOUR     ,8HX    ,08HY   ,8HS     ,8HBI     ,
      +8HA     ,8HDP ,8HTI    ,8HW    ,8HWI   ,
      +8HU     ,8HV   ,8HDI    ,8HP     ,8HC     ,
```

```
      +8HNH   ,8HCL ,8HH    ,8HHI   ,8HCM
      +8HCH   ,8HST ,8HPW  ,8HCD  ,8HCK
C
      DATA FTRUEL/
      +3*1.,1800.,1.,3*0.,–5.,0.,–88.,4*0.,2*–102.2,0.,870.,11*0.
C
      DATA FTRUEU/
      +648.,12.,16202.,2054.,31.,23,,2*2.,40.,2.,58.,70.,S.,102.2,1.
      +,2*102.2,5.,1074.6,2*9.,2*10.)I.)2*10.,7.,99.,999.,62./
C
      DATA FUNITS/
      +6*1.,1,1.,2*.1,1.,.1,1.,2*.1,1.,.1,11*1./
C
      DATA FBASE/
      +3*0,1799,0,3*–1,–51,–1,–881,4*–1,2*–1023,–1,8699,10*–1,0/
C
      DATA BITS/
      +10,4,14,8,4*5,9,2,11,10)3,10,2,2*11,3,1114*4,2,3*4,7)10,6/
C
      DATA OFFSET/
      + 0, 10, 14, 28, 36, 41, 46, 51, 56, 65, 67, 78, 88, 91,101
      +,103,114,125,128,139,143,147,151,155,157,161,165,169,176 186/
      END
C
      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QI21
C     READ AND PRJNT MSUG1 GROUP1
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1         2       3        4        5        6         7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR      DATE   DESCRIPTION
C
C     .01D.     SL      85/01/25.       REVISED COMMENTS.
C
C
C     1         2       3        4        5        6         7
C     IMPLICIT INTEGER(A–E,G–Z)
C
C     PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=384,ID=1
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=37)
C
      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C     DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01D/,BUF/DIM BUF*O/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI21',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSUG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C
      SUBROUTINE WRMSUG1(FTRUE)
      IMPLICIT INTEGER(A–E,G–Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(1),I=1,5)
      +,((FTRUE(5+(J–I)*4+I),J=1,8),I=1,4)
100   FORMAT(/' YEAR ',F5.0,' MONTH 1,F3.0,' BOX2 1,F6.0
      +,' BOX10 1,F4.0,1 CHECKSUM ',F6.0/
      +8X,'3'17XO YM) 7X,'N',7X,)E),7X,'D',7X,'H',7X, )X) 07X) 'Y'/
      +1X,'S',2F8.2,F8.0,FS.2,2F8.0,2F8.1/
```

```
      –1X,’A’,2F8.2,F8.0,F8.2,2FS.0,2F8.1/
      +1X,’P’,2F8.2,F8.0,F8.2,2F8.0,2F8.1/
      +1X,’Q’,2F8.2,F8.0,F8.2,2F8.0,2F8.1)
      END
C     GROUP 1
      BLOCK DATA MSUG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSUCl/FUNITS(37),FBASE(37),BITS(37),DFFSET(37)
C
      DATA FUNITS/5*1
      +,4*.01
      +,4*.01
      +,4*1.
      +,4*.01
      +,4*2.
      +,4*2.
      +,4*.2
      +,4–.2/
C
      DATA FBASE/1799,4*0
      +,–501.,–8801.,86999.,–1.
      +,–501.,–8801.)86999.,–1.
      +,4*0.
      +,4*–1.
      +,4*0.
      +,4*–.5
      +,4*–.5
C
      DATA BITS/8,4,14,10,12,16*16,16–4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
      +,144,160,176,192,208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360,364,368,372,376,380/
      END
C     SEE Q19 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QI22
C     READ AND PRINT MSUG1 GROUP 2
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1      2     3      4      5      6       7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR    DATE   DESCRIPTION
C
C     .01D.   SL    85/01/25.    REVISED COMMENTS.
C     C
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=5,BPR=384,ID=2
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=37)

      COMMON /MSUG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)

C     DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)

C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01D/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI22',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      4,BPR,BPW)RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSUG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT REPORTS ',BUF(2),', EOF 1 PJEOF END
C
      SUBROUTINE WRMSUG1(FTRUE)
      IMPLICIT INTEGER(A–E,G–Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),Izl,S)
      +,((FTRUE(S+(J–1)*4+I),J=1),8),I=1,4)
100   FORMAT(/' YEAR ' F5.0,' MONTH ', F3.0,' BOX2 ',F6.0
      +, ' BOX10 ', F4.0,' CHECKSUM ',F6.0/
      +SX,'3',7X,'M',7X)'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
      +1X, 'W',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
```

```
      +1X,'U',2F8.2,F8.0,F8.2,2F8.0,2F8.1/
      +1X,'V',2F8.2,FS.0,F8.2,2F8.0,2F8.1/
      +1X,'C',2F8.1,FS.0,F8.1,2F8.0,2F8.1)
      END
C     GROUP 2
      BLOCK DATA MSUGI
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSUGI/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/5*1.
      +,3*.01,.1
      +,3*.01,.1
      +,4*1.
      +,3*.01,.1
      +,4*2.
      +,4*2.
      +,4*.2
      +,4*.2/
C
      DATA FBASE/1799,4*0
      +,–1.,2*–10221.,–I.
      +,–1.,2*–10221.,–l.
      +,4*0.
      +,4*–1.
      +,4*0.
      +,4*–.5
      +,4*–.5
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
      +,144,160,176,192,208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360,364,368,372,376,380/
      END
```

SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN

```
      PROGRAM QI24
C     READ AND PRINT DSU2
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1       2      3       4       5       6        7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR      DATE   DESCRIPTION
C
C     .01C.    SL     85/01/25.     REVISED COMMENTS.
C
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=250,RPTOFF=1,FMISS=–9999.,INDEXCK=5,BPR=960,1D=0
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–I)/BPW+1,DIM UN=58)
C
      COMMON /DSU2/FUNITS(58),FBASE(58),BITS(58),OFFSET(58)
C
C     DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(8,6)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME (TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QI24',A4,2A9)
C
100   CALL GETRPT(I,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK , DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      PRINT 300,FTRUE
300   FORMAT(/' DECADE ),F4.0,' MONTH ',F3.0,' BOX2 ',F6.0,' BOX10
      +,F4.0,' CHECKSUM ',F6.0/
      +8X,'O',7X,'1',7X,'2',7X,'3',7X,'4',7X,'5',7X,'6',7X,'N'/
      +1X,'S',7F8.2,F8.0/
      +1X,'A',7F8.2,F8.0/
      +1X,'U',7F8.2,F8.0/
      +1X,'V',7F8.2,F8.0/
      +1X,'P',7F8.2,F8.0/
      +1X,'R',7F8.1,F8.0/
      +1X,'U',F8.2,' V ',F8.2,' UV ',F8.2,' UU ',F8.2,' VV ',F8.2)
      IF(BUF(2) . LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF END
```

```
C
      BLOCK DATA DSU2
      IMPLICIT INTEGER(A–E,G–Z)
      COMMON /DSU2/FUNITS(58),FBASE(58),BITS(58),OFFSET(58)
C
      DATA FUNITS/5*1.
      +,7*.01,1. 7*.01,1. P7*.01pl. p7*.01,1. J,7*.01,1. 7*.1,1.
      +,5*.01/
C
      +,FBASE/179,4*0
      +,7*–501,0 7*–8801,0 #7*–10221,0 7*–10221,0 7*86999,0 7*–1,0
      +,2*–10221,–522243,2*–1/
C
      +,BITS/8,4,14,10,12,50*16,3*32/
C
      +,OFFSET/
C
      + 16, 24, 28, 42, 52, 64, 80, 96,112,128,144,160,176,192,208,224                    +,240,256,272,288,304,320,336,352,368,384,400,416,432,4
48,464,480 +,496,512,528,544,56OPS76,592p6O8,624,640,656,672,688,704,720,736
      +,752,768,784,800,816,832,848,864,896,928/
      END
C
      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QL14
C     READ AND PRINT MST3
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1       2     3      4      5      6      7
C
C     REVISION HISTORY
C     LEVEL   AUTHOR       DATE   DESCRIPTION
C
      .01C.   SL    85/01/25.     REVISED COMMENTS.
C
C     1       2     3      4      5      6      7
C
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=60,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=3712,ID=0
     +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=271)
C
      COMMON /MST3/FUNITS(271),FBASE(271),BITS(271),OFFSET(271)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(19,14)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*O/
C
      CALL DATE(DTE)
      CALL TIME (TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL14',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UNDIM UN,FTRUE,JEOF)
      IF(JEOF.NE.O)GOTO 900
C
      PRINT 300,(FTRUE(I),I=1,5)
300   FORMAT(/' YEAR ',F5.0,' MONTH ',F3.0,' BOX2 ',F6.0
     +' BOX1010 ',F4.0,' CHECKSUM ',F6.0/
     +9X,7X,'D',7X,'H',7X,'X',7X,'Y',7X,'N',7X,'M',7X,'S'
     + 7X,10',7X '11,7X,'2',7X,'3',7X,'4',7X,'5',7X,'6')
      PRINT    301,((FTRUE2(I,J),J=1,14),I=1,19)
301   FORMAT(1X,'S ',F8.1,3F8.2,F8.0, 9F8.2/
     +1X,'A    ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'W    ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'U    ',FB.1,3F8.2,F8.0,9F8.2/
     +1X,'V    ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'P    ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'C    ',F8.1,3F8.2,F8.0,9F8.1/
     +1X,'Q    ',F8.1,3F8.2,F8.0,9F8.2/
     +1X,'R    ',F8.1,3F8.2,F8.0,9F8.1/
```

```
        +1X,'S–A          'F8.1,3F8.2,F8.0,9F8.2/
        +1X,'(S–A)*W   ',F8.1,3F8.2,F8.0,9F8.1/
        +1X,'QS–Q       ',F8.1,3F8.2,F8.0,9F8.2/
        +1X,'(QS–Q)*W'           ,F8.1,3F8.2,F8.0,9F8.1/
        *1X,'W*U         ',F8.1,3F8.2,F8.0,9F8.1/
        *1X,'W*V         ',F8.1,3F8.2,F8.0,9F8.1/
        *1X,'U*A         ',F8.1,3F8.2,F8.0,9F8.1/
        +1X,'V*A         OF8.1,3F8.2,F8.0,9F8.1/
        +1X,'U*Q         F8.1,3F8.2,F8.0,9F8.1/
        +1X,'V*Q         ',F8.1,3F8.2,F8.0,9F8.1)
        IF(BUF(2).LT.MAX)GOTO 100
C
900     PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
        END
C
        BLOCK DATA MST3
        IMPLICIT INTEGER(A–E,G–Z)
C
        COMMON /MST3/FUNITS(271),FBASE(271),BITS(271),OFFSET(271)
C
        DATA FUNITS/5*1.
        +,19*.2,57*.01,19*1.
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1
        +,6*.01,.1,.01,.1,.01,7*.1/
C
        DATA FBASE/1799,4*0
        +,19*4,57*–1,19*0
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        19*–1
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001
        +,–501,–8801,–1,2*–10221,86999,3*–1
        +,–6301,–10001,–4001,–10001,2*–30001,2*–20001,2*–10001/
C
        DATA BITS/8,4,14,10,12,76*8,190*16/
C
        DATA OFFSET/ 16, 24, 28, 42, 52, 64
        +, 72, 80, 88, 96, 104, 112, 120, 128, 136, 144, 152, 160, 168, 176, 184, 192
```

```
          +,200,208,216,224,232,240,248,256,264,272,280,288,296,304,312,320          +,328,336,344,352,360,368,376,384,392,400,408,416,424,4
32,440,448 +,456,464,472,480,488,496,504,512,520,528,536,544,552,560,568,576          +,584,592,600,608,616,624,632,640,648,656,664,672,688,7
04,720,736 +,752,768,784,800,816,832,848,864,880,896,912,928,944,960,976,992          +,1008,1024,104001056,1072,1088,1104,1120,1136,1152,1
168,1184,1200       +,1216,1232,1248,1264,1280,1296,1312,1328,1344,1360,1376,1392,1408   +,1424,1440,1456,1472,1488,1504,1520,1536,1552,1568,1
584,1600,1616       +,1632,1648,1664,1680,1696,1712,1728,1744,1760,1776,1792,1808,1824   +,1840,1856,1872,1888,1904,1920,1936,1952,1968,1984,2
000,2016,2032       +,2048,2064,2080,2096,2112,2128,2144,2160,2176,2192,2208,2224,2240   +,2256,2272,2288,2304,2320,2336,2352,2368,2384,2400,2
416,2432,2448       +,2464,2480,2496,2512,2528,2544,2560,2576,2592,2608,2624,2640,2656   +,2672,2688,2704,2720,2736,2752,2768,2784,2800,2816,2
832,2848,2864       +,2880,2896,2912,2928,2944,2960,2976,2992,3008,3024,3040,3056,3072   +,3088,3104,3120,3136,3152,3168,3184,3200,3216,3232,3
248,3264,3280       +,3296,3312,3328,3344,3360,3376,3392,3408,3424,3440,3456,3472,3488   +,3504,3520,3536,3552,3568,3584,3600,3616,3632,3648,3
664,3680,3696/
          END
C
          SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QL16
C     READ AND PRINT TRP1
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE I
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1    2    3    4    5    6    7
C
C     REVISION HISTORY
C     LEVEL  AUTHOR    DATE  DESCRIPTION
C
C     .01C.  SL   85/01/25.   REVISED COMMENTS.
C
C     1    2    3    4    5    6    7
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=250,RPTOFF=1,FMISS=O.,INDEXCK=S,BPR=256,ID=0
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–I)/BPW+1,DIM UN=23)
C
      COMMON /TRP1/FUNITS(23),FBASE(23),BITS(23),OFFSET(23)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(6,3)
      EQUIVALENCE (FTRUE(6),FTRUE2)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*O/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL16',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FL)NITS,FBASE,BITS,DFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.O)GOTO 900
C
      PRINT 300,FTRUE
300   FORMAT(/' YEAR 1,F5.0,' MONTH ',F3.0,' BOX2 ',F6.0,' BOX10 ',F4.0
      +,' CHECKSUM ',F5.0/
      +,9X,'S ',6X,'A ',6X,'U ',6X,'V ',6X,'P ',6X,'R
      +,1X,'NI',6F8.0/
      +,1X,'NL',6F8.0/
      +,1X,'NU',6F8.0)
      IF(BUF(2).LT.MAX)GOTO 100
C
      900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END

      BLOCK DATA TRP1
      IMPLICIT INTEGER(A–E,G–Z)
```

```
      COMMON /TRP1/FUNITS(23),FBASE(23),BITS(23),OFFSET(23)
C
      DATA FUNITS/5*1.

C
     +,FBASE/1799,4*0
     +,18*0/
C
     *,BITS/8,4,14,10,12
     +,6*12,12*10/
C
     +,OFFSET/ 16, 24, 28, 42, 52
     +, 64, 76, 88,100,112,124,136,146,156,166,176,186,196,206,216,226
     +,236,246/
C
      END
```

SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN

```
      PROGRAM QL21
C     READ AND PRINT CMR5
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1       2       3       4       5       6       7
C
C     REVISION HISTORY
      LEVEL   AUTHOR      DATE    DESCRIPTION
C
C     .01C.   SL      85/01/25.   REVISED COMMENTS.
C
C     1       2       3       4       5       6       7
      IMPLICIT INTEGER(A–E,G–Z)

C     PARAMETER(MAX=300,RPTOFF=I,FMISS=–999.9,INDEXCK=35,BPR=192,ID=0
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+I,DIM PK=(BPR–I)/BPW+1,DIM UN=35)
C
      COMMON /CMR5/FIELD(35),FTRUEL(35),FTRUEU(35),FUNITS(35)
      +,FBASE(35),BITS(35),DFFSET(35)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME (TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT('1QL21',A4,2Ag)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,DFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.O)GOTO 900
C
      PRINT 300,(FIELD(I),FTRUE(l),1=1,DIM UN)
300   FORMAT(6(1X,A5,F7.1))
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C
      BLOCK DATA CMR5
      IMPLICIT INTEGER(A–E,G–Z)

      COMMON /CMR5/FIELD(35),FTRUEL(35),FTRUEU(35),FUNITS(35)
      +,FBASE(35),BITS(35),OFFSET(35)
C
      DATA FIELD/SHBOX10 8HMONTH 8HBOX2 8HYEAR 8HDAY
      +8HHOUR  ,8HX     ,8HY     ,8HS     ,8HBI    ,8HA     ,
      +8HDP    ,8HTI    ,8HU     ,8HV     ,8HDI    ,8HWI    ,
      +8HP     ,8HC     ,8HNH    ,8HCL    ,8HH     ,8HHI    ,
      *8HCM    ,8HCH    ,8HST    ,8HPW    ,8HCD    ,8HLF    ,
```

```
          +8HSF     ,8HAF     ,8HRF     ,8HWF    ,8HPF ,8HCK          /
C
          DATA FTRUEL/3*1.,1800.,1.,3*0.,–5.,0.,–88.)2*0.,2*–102.2)2*0.,870.
          +,17*0./
C
          DATA FTRUEU/648.,12.,16202.,2054.,31.,23.,2*2.,40.,2.,58.,70.,5.
          +,2*102.2,5.,1.,1074.6,2*9.,2*10.,1.,2*10.,7.,99.,999.,0.,5*2.,30./
C
          DATA FUNITS/6*1.,3*.1,1.,2*.1,1.,2*.1,2*1.,.1,17*1./
C
          DATA FBASE/3*0,1799,0,3*–1,–51,–1,–881,2*–1,2*–1023,2*–1,8699
          +,16*–1,0/
C
          DATA BITS/10,4,14,8,4*5,9,2,11,10,3,2*11,3,2,11,4*4,2,3*4,7)10
          +,1,5*2,5/
C
C         RPTOFF 0
C         DATA OFFSET/
C         + 64,74,78,92,100,105,110,115,120,129,131,142,152,155,166,177
C         +,180,182,193,197,201,205,209,211,215,219,223,230,240,241,243,245
C         +0247,249,251/
C
C         RPTOFF 1
          DATA OFFSET/
          + 0,10,14,28,36,41,46,51,56,65,67,78,88,91,102,113
          + 116,118,129,133,137,141,145,147)151,155,159,166,176,177,179,181
          +,183,185,187/
          END
C
          SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
          PROGRAM QL28
C         READ AND PRINT MSTG1 GROUP 3
C
C         RPTIN, BUFFER IN, UNIT, LENGTH, GBYTEIS, DATE AND TIME ARE
C         MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C         SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C         PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C         WORD.
C         1         2         3         4         5         6         7
C
C         REVISION HISTORY
C         LEVEL     AUTHOR    DATE      DESCRIPTION
C
C         .01C.     SL        85/01/25. REVISED COMMENTS.
C
C         1         2         3         4         5         6         7
C         IMPLICIT INTEGER(A–E,G–Z)
C
          PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=5,BPR=384,ID=3
          +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=37)
C
          COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
          DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C         2 DIMENSIONAL FTRUE
          DIMENSION FTRUE2(4,8)
          EQUIVALENCE (FTRUE(6),FTRUE2)
          DATA LEVEL/4H.01C/,BUF/DIM BUF*O/
C
          CALL DATE(DTE)
          CALL TIME(TME)
          PRINT 1,LEVEL,DTE,TME
1         FORMAT('1QL28',A4,2A9)
C
100       CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
          +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
          IF(JEOF.NE.0)GOTO 900
C
          CALL WRMSTG1(FTRUE)
          IF(BUF(2).LT.MAX)GOTO 100
C
900       PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
          END
C
          SUBROUTINE WRMSTGI(FTRUE)
          IMPLICIT INTEGER(A–E,G–Z)
          DIMENSION FTRUE(37)
          PRINT 100,(FTRUE(I),I=1,5)
          +,((FTRUE(5+(J–1)*4+I),J=1,8),I=1,4)
100       FORMAT(/' YEAR ',FS.0,' MONTH ',F3.0,' BOX2 ',F6.0
          +,' BOX10 ',F4.0,' CHECKSUM ',F6.0/
          +9X,7X,'3',7X,'M',7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
          +1X,'S '2F8.2,F8.0,F8.2,F8.0,3F8.1/
```

```
      +1X, A        ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
      +1X,'Q        ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
      +1X,'R        ',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C     GROUP 3
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
      +,1.E–2, 1.E–2, 1.E–2, 0.1
      +,1.E–2, 1.E–2, 1.E–2, 0.1
      +,1., 1., 1., 1.
      +,1.E–2, 1.E–2, 1.E–2, 0.1
      +,2., 2., 2., 2.
      +,0.1, 0.1, 0.1, 0.1
      +,0.2, 0.2, 0.2, 0.2
      +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
      +, –501., –8801., –1.,      –1.
      +, –501., –8801., –1.,      –1.
      +, 0., 0., 0., 0.
      +, –1., –1., –1., –1.
      +, 0., 0., 0., 0.
      +, –1., –1., –1., –1.
      +, –.5, –.5, –5, –.5
      +, –.5, –.5, –.5, –.5/
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 52, 64, 80, 96, 112, 128
      +, 144, 160, 176, 192, 2O8, 224, 240, 256,272,288
      +, 304, 320, 324, 328, 332, 336, 340, 344, 348, 352
      +, 356, 360, 364, 368, 372, 376, 380/
      END
C
      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QL29
C     READ AND PRINT MSTC1 GROUP 4
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C
C     1          2          3          4          5          6          7
C     REVISION HISTORY
C     LEVEL      AUTHOR     DATE       DESCRIPTION

C     .01C.      SL         85/01/25.  REVISED COMMENTS.
C
C     1          2          3          4          5          6          7
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=384,ID=4
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=37)
C
      COMMON /MSTC1/FUNITS(37), FBASE(37), BITS(37), OFFSET(37)
C
C     DIMENSION BUF(DIM BUF), PK(DIM PK), UN(DIM UN), FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
      DATA LEVEL/4H.01C/,BUF/DIM BUF–0/
C
      CALL DATE(DTE)
      CALL TIME (TME)
      PRINT 1,LEVEL,DTE,TME
      1 FORMAT(’1QL29’,A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,DFFSET,INDEXCK,ID
      *,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.O)GOTO 900
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,’ REPORTS ’,BUF(2),’, EOF ’,JEOF
      END
C
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A–E,G–Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),I=1, 5)
      +,((FTRUE(5+(J–1)*4+I),J=1,8),1=1,4)
100   FORMAT(/’ YEAR ’,F5.0,’ MONTH ’,F3.0,’ BOX2 ’,F6.0
      +” BOX10 1,F4.0,’ CHECKSUM ’,F6.0/
      +9X,7X,’3’,7X,’M’,7X,’N’,7X,’E’,7X,’D’,7X,’H’,7X,’X’,7X,’Y’/
      +1X,’W ’,2FS.2,F8.0,F8.2,F8.0,3F8.1/
```

```
      +1X,'U ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
      +1X,'V ',2F8.2,F8.0,F8.2,F8.0,3F8.1/
      *1X,'P ',2F8.2,F8.OIF8.2,F8.0,3F8.1)
      END
C     GROUP
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
      +,1.E–2, 1.E–2, 1.E–2, 1.E–2
      +,1.E–2, 1.E–2, 1.E–2, 1.E–2
      +,1., 1., 1., 1.
      +,1.E–2, 1.E–2, 1.E–2, 1.E–2
      +,2., 2., 2., 2.
      +,0.1, 0.1, 0.1, 0.1
      +,0.2, 0.2, 0.2, 0.2
      +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
      +,–1., –10221., –10221., 86999.
      +,–1., –10221., –10221., 86999.
      +, 0., 0., 0., 0.
      + , –1., –1., –1., –1.
      +,0., 0., 0., 0.
      +,–1., –1., –1., –1.
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 520 64, 80, 96,112,128
      +,144,160,176,192,208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360,364,368,372,376,380/
      END
C
      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QL30
C     READ AND PRINT MSTGI GROUP 5
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1        2        3        4       5        6        7
C
C     REVISION HISTORY
C     LEVEL    AUTHOR   DATE     DESCRIPTION

C     –01C.    SL       85/01/25.  REVISED COMMENTS.
C
C     1        2        3        4       5        6        7
C     IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=384,ID=6
      +,BPW=60,DIM BUF=(1006*64–1)/BPW+I,DIM PK=(BPR–I)/BPW+1,DIM UN=37)
C
      COMMON /MSTGI/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
      2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,8)
      EQUIVALENCE (FTRUE(6),FTRUE2)
      DATA LEVEL/4H.OIC/,BUF/DIM BUF*O/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
      1 FORMAT('1QL30',A4,2A9)
C
100   CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
      +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
C     IF(JEOF.NE–O)GOTO 100

      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,' REPORTS ',BUF(2),', EOF ',JEOF
      END
C
      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A–E,G–Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(1),I=1,5)
      +,((FTRUE(5+(J–I)–4+1),J=1,8),1=1,4)
100   FORMAT(/' YEAR ',F5.0,) MONTH ',F3.0,' BOX2 ',F6.0
      +,' BOX10 ',F4.0,1 CHECKSUM ',F6.0/
      +9X,7X,'3',7X,'MP,7X,'N',7X,'E',7X,'D',7X,'H',7X,'X',7X,'Y'/
      +1X,'C ',2F8.1,FS.0,F8.1,F8.0,3F8.1/
```

```
      +1X,'R',2F8.1,F8.0,F8.1,F8.0,3F8.1/
      +1X,'W*U',2F8.1,F8.0,F8.1,F8.0,3F8.1/
      +1X,'W*V',2F8.1,F8.0,F8.1,F8.O,.3FS.1)
      END

      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
      +,0.1, 0.1, 0.1, 0.1
      +,0.1, 0.1, 0.1, 0.1
      +,1., 1., 1., 1.
      +,0.1, 0.1, 0.1, 0.1
      +,2., 2., 2., 2.
      +,0.1, 0.1, 0.1, 0.1
      +,0.2, 0.2, 0.2, 0.2
      +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., .0
      +, –1., –1., –30001., –30001.
      +, –1., –1., –30001., –30001.
      +, 0., 0., 0., 0.
      +, –1., –1., –1., –1.,
      +, 0., 0., 0., 0.
      +, –1., –1., –1., –1.,
      +, –.5, –.5, –.5, –.5/
C
      DATA BITS/ 8, 4, 14, 10, 12, 16*16, 16*4/
C
      DATA OFFSET
      +/ 16, 24, 28 , 42, 52, 64, 80, 96,112,128
      +,144,160,176,192,208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360,364,368,372,376,380/
      END
C
      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
      PROGRAM QL31
C     READ AND PRINT MSTGI GROUP 6
C
C     RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C     MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C     SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C     PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C     WORD.
C     1        2        3        4        5        6        7
C
C     REVISION HISTORY
C     LEVEL    AUTHOR   DATE       DESCRIPTION
C
C     .01C.    SL       85/01/25.  REVISED COMMENTS.
C
C     1        2        3        4        5        6        7
      IMPLICIT INTEGER(A–E,G–Z)
C
      PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=384,ID=6
     +,BPW=60,DIM BUF=(1006*64–1)/BPW+1,DIM PK=(BPR–1)/BPW+1,DIM UN=37)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),DFFSET(37)
C
      DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C     2 DIMENSIONAL FTRUE
      DIMENSION FTRUE2(4,B)
      EQUIVALENCE (FTRUE(6),FTRUE2)
      DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
      CALL DATE(DTE)
      CALL TIME(TME)
      PRINT 1,LEVEL,DTE,TME
1     FORMAT(’1QL31’, A4, 2A9)
C
100   CALL GETRPT(1,.FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
     +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
      IF(JEOF.NE.0)GOTO 900
C
      CALL WRMSTG1(FTRUE)
      IF(BUF(2).LT.MAX)GOTO 100
C
900   PRINT *,’ REPORTS ’,BUF(2),’, EOF ’,JEOF
      END

      SUBROUTINE WRMSTG1(FTRUE)
      IMPLICIT INTEGER(A–E,G–Z)
      DIMENSION FTRUE(37)
      PRINT 100,(FTRUE(I),1=1,5)
     +, ((FTRUE(S+(J–1)*4+I),J=1,8),I=1,4)
100   FORMAT(/’ YEAR ’,FS.0,’ MONTH ’,F3.0,’ BOX2 ’,F6.0
     +,’ BOX10 1,F4.0,’ CHECKSUM’ ,F6.0/
     +9X, 7X, ’3’, 7X, ’M’, 7X, ’N’, 7x, ’E’, 7X, ’D’, 7X, ’H’, 7X, ’X’, 7X, ’Y’/
     +1X,’S–A ’,2F8.2, FS.0, FS.2,F8.0,3F8.1/
```

```
      +1X,'(S–A)*W',2F8.1,F8.0,F8.1,F8.0,3F8.1/
      +1X,'QS–Q',2F8.2,F8.0,F8.2,F8.0,3F8.1/
      +1X,'(QS–Q)*W',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END
C     GROUP
      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1.
      +, 1.E–2, 0.1, 1.E–2, 0.1
      +, 1.E–2, 0.1, 1.E–2, 0.1
      +, 1., 1., 1., 1. +,1.E–2, 0.1,
      +, 1.E–2, 0.1 +,2., 2., 2., 2.
      +, 0.1, 0.1, 0.1, 0.1 +,0.2, 0.2, 0.2, 0.2
      +, 0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
      +, –6301., –10001., –4001., –10001.
      +, –6301., –10001., –4001., –10001.
      +, 0., 0., 0., 0.
      +, –1., –1., –1., –1.
      +, 0.,0., 0., 0.
      +, –1., –1., –1., –1.
      +, –.5, –.5, –.5, –.5
      +, –.5, –.5, –.5, –.5
C
      DATA BITS/8,4,14,10,12,16*16,16*4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
      +,144,160,176,192,208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360,364,368,372,376,380/
      END

      SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN
```

```
        PROGRAM QL32
C       READ AND PRINT MSTGI GROUP 7
C
C       RPTIN, BUFFER IN, UNIT, LENGTH, GBYTE/S, DATE AND TIME ARE
C       MACHINE–DEPENDENT ROUTINES AND FUNCTIONS. SEE COADS RELEASE 1
C       SUPPLEMENT H FOR A DESCRIPTION OF THEIR BEHAVIOR. BPW IS A
C       PARAMETER WHICH MUST BE SET TO THE NUMBER OF BITS PER MACHINE
C       WORD.
C
C
C       REVISION HISTORY
C       LEVEL    AUTHOR   DATE       DESCRIPTION
C
C       .01C.    SL       85/01/25.  REVISED COMMENTS.
C
C       1        2        3          4      5      6      7
C       IMPLICIT INTEGER(A–E,G–Z)
C
        PARAMETER(MAX=400,RPTOFF=1,FMISS=–9999.,INDEXCK=S,BPR=384,ID=7
        +,BPW=60,DIM BUF=(1006*64–1)/BPW+I,DIM PK=(BPR–1)/BPW+1,DIM UN=37)
C
        COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),DFFSET(37)
C
        DIMENSION BUF(DIM BUF),PK(DIM PK),UN(DIM UN),FTRUE(DIM UN)
C
C       2 DIMENSIONAL FTRUE
        DIMENSION FTRUE2(4,8)
        EQUIVALENCE (FTRUE(6),FTRUE2)
        DATA LEVEL/4H.01C/,BUF/DIM BUF*0/
C
        CALL DATE(DTE)
        CALL TIME(TME)
        PRINT 1,LEVEL,DTE,TME
        1 FORMAT(’1QL32’,A4,2A9)
C
100     CALL GETRPT(1,FMISS,FUNITS,FBASE,BITS,OFFSET,INDEXCK,ID
        +,BPR,BPW,RPTOFF,BUF,DIM BUF,PK,DIM PK,UN,DIM UN,FTRUE,JEOF)
        IF(JEOF.NE.0)GOTO 900
C
        CALL WRMSTG1(FTRUE)
        IF(BUF(2).LT.MAX)GOTO 100
C
900     PRINT *,’ REPORTS ’,BUF(2),’, EOF ’,JEOF
        END
C
        SUBROUTINE WRMSTG1(FTRUE)
        IMPLICIT 1NTEGER(A–E,G–Z)
        DIMENSION FTRUE(37)
        PRINT 100,(FTRUE(I),I=1,5) +,((FTRUE(5+(J–1)*4+I),J=1,8),I=1,4)
100     FORMAT(/’ YEAR ’,FS.0,’ MONTH ’,F3.0,’ BOX2 ’,F6.0
        +,’ BOX10 ’,F4.0,’ CHECKSUM ’,F6.0/
        +9X, 7X, ’3’, 7X, ’M’, 7X, ’N’, 7X, ’E’, 7X, ’D’, 7X, ’H’, 7X, ’X’, 7X, ’Y’/
        +1X, ’U*A’,2F8.1, F8.0, F8.1, F8.0, 3F8.1/
```

```
      +1X,'V*A    ',2FS.1,F8.0,F8.1,F8.0,3F8.1/
      +1X,'U*Q    ',2F8.1,F8.0,F8.1,F8.0,3F8.1/
      +1X,'V*Q    ',2F8.1,F8.0,F8.1,F8.0,3F8.1)
      END

      BLOCK DATA MSTG1
      IMPLICIT INTEGER(A–E,G–Z)
C
      COMMON /MSTG1/FUNITS(37),FBASE(37),BITS(37),OFFSET(37)
C
      DATA FUNITS/1., 1., 1., 1., 1.
      +,0.1, 0.1, 0.1, 0.1
      +,0.1, 0.1., 0.1, 0.1
      +,1., 1., 1., 1.
      +,0.1, 0.1, 0.1, 0.1
      +,2., 2., 2., 2.
      +,0.1, 0.1, 0.1, 0.1
      +,0.2, 0.2, 0.2, 0.2
      +,0.2, 0.2, 0.2, 0.2/
C
      DATA FBASE/1799., 0., 0., 0., 0.
      +, –20001., –20001., –10001., –10001.
      +, –20001., –20001., –10001., –10001.
      +, 0., 0.,       0., 0.
      +, –1., –1., –1., –1.
      +, 0., 0., 0., 0.
      +, 5, .5, .5, .5/
C
C     DATA BITS/8,4)14,10,12,16*16,16*4/
C
      DATA OFFSET
      +/ 16, 24, 28, 42, 52, 64, 80, 96,112,128
      +,144,160,176,192)208,224,240,256,272,288
      +,304,320,324,328,332,336,340,344,348,352
      +,356,360)364,368,372,376,380/
      END
```

SEE QI9 FOR LISTINGS OF SUBROUTINES GETRPT AND RCDIN

```
      CONVERTED BY CONVRT: TSCON.01B
      PROGRAM RDINV
C
C
C
C     PURPOSE – READ PACKED INVENTORIES FOR PRE–70’S DR
C     70’S DATA MADE BY PROGRAM DUPELIM
C
C     WRITTEN BY – JANE HISCOX
C
C
       REVISION HISTORY
C     LEVEL AUTHOR DATE DESCRIPTION
C
C     .01B. SL 85/01/30. REVISED COMMENTS; CONVERT FROM
C                        TIMESHARING FORTRAN.

C
      IMPLICIT INTEGER (A–Z)
      CHARACTER*4 LEVEL
C
      DIMENSION STORE (5000), CARD (50)
C
      COMMON /QC/ INVNF (14,11)
C
      DATA LEVEL /’.O1B’/, NSTORE, NSID, NCD, NDS/ 5000, 24, 50, 8/
      DATA RQC, CQC/ 14, 11/, BITBOX, BITYR, BITIOD, BITGT / 10, 8, 15,
      *20/
      DATA IU, JU, OU 1, 2, 5/
      DATA CARD / 110, 116, 117, 118, 119, 128, 143, 150, 151, 152, 155,
      + 156, 184, 185, 186, 187, 188, 189, 192, 193, 194, 195,
      + 196, 197, 281, 555, 666, 849, 850, 876, 877, 878, 879,
      + 880, 881, 882, 888, 889, 891, 897, 898, 899, 900, 901,
      + 902, 926, 927, 928, 999, 50/
C
      REWIND IU
      REWIND JU
      REWIND DU
C
      DTE = DATE (K)
      TME = TIME (K)
      READ (JU,*,END=900) BOX
      WRITE (5,S) BOX, LEVEL, DTE, TME
      5 FORMAT (’1 INVENTORIES FOR BOX ’,I3,T60,’BY RDINV’,A,2X,2A10)
C
100   BUFFER IN (IU,0) (STORE(1), STORE(NSTORE))
      IF (UNIT(IU) LT. 0) THEN
      OFF = 0
      NWORD = 1
      CALL GBYTE (STORE(NWORD), BOX10, OFF, BITBOX)
      IF (BOX10 EQ. BOX) THEN
      OFF = OFFSET (OFF,NWORD,BITBOX)
      175CALL GBYTE (STORE(NWORD), YEAR, OFF, BITYR)
      OFF = OFFSET (OFF,NWORD,BITYR)
      IF (YEAR NE. 0) THEN
      YEAR = YEAR + 1799
```

```
        WRITE (5,200) YEAR
        200 FORMAT (//' YEAR = ',I4,/1X,
        'MO. IN OUT UNCERTAIN', /1X,26('='))
        SUMI = 0
        SUMO = 0
        SUMD = 0
        DO 225 MO = 1,12
        CALL GETNUM (STORE, IMO, OFF, NWORD, BITIOD)
        CALL GETNUM (STORE, OMO, OFF, NWORD, BITIOD)
        CALL GETNUM (STORE, DMO, OFF, NWORD, BITIOD)
        IF (IMO NE. 0) WRITE (5,210) MO, IMO, OMO, DMO
210     FORMAT (lX,I2,lX,2I6,3X,I6)
        SUMI = SL)MI + IMO
        SUMO = SLJMO + OMO
        SUMD = SL)MD + DMO
225     CONTINUE
        WRITE (5,250) SL)MI, SLIMO, SUMD
250     FORMAT (lX,26('=')/4X,2I6,3X,I6)
C
C       UNPACK YEARLY TOTALS FOR SOURCE IDS
        WRITE (5,260)
260     FORMAT (//' TOTALS BY SID',/
        +1X,'SID IN OUT UNCERTAIN',/1X,
        +36('='))
        SUMI = 0
        SUO = 0
        SUMD = 0
        DO 300 JR = 1,NSID
        CALL GETNUM (STORE, ISID, OFF, NWORD, BITIOD)
        CALL GETNUM (STORE, OSID, OFF, NWORD, BITIOD)
        CALL GETNUM (STORE, DSID, OFF, NWORD, BITIOD)
        IF (ISID NE. 0) WRITE (5,275) JR, ISID, OSID, DSID
275     FORMAT (1X,I3,3(3X,I7))
        SUMI = SUMI + ISID
        SUMD = SUMO + OSID
        SLIMD = SUMD + DSID
300     CONTINUE
        WRITE (5,325) SLJMI, SUMO, SLJMD
325     FORMAT (1X, 36('='),/4X,3(3X,I7))
        GO TO 175
        ENDIF
C
C       UNPACK GRAND TOTALS BY SID
        WRITE (5,350) BOX10
350     FORMAT ('1 GRAND TOTALS FOR BOX ',I3,//
        +1X,' SID IN OUT UNCERTAIN',/1X,
        +36('='))
        SUMI = 0
        SUMO = 0
        SUMD = 0
        DO 400 JR = 1,NSID
        CALL GETNLIM (STORE, ISID, OFF, NWORD, BITGT)
        CALL GETNUM (STORE, OSID, OFF, NWORD, BITGT)
        CALL GETNUM (STORE, DSID, OFF, NWORD, BITGT)
        IF (ISID NE. 0) WRITE (5,275) JR, ISID, OSID, DSID
        SLJMI = SLUI + ISID
```

```
          SUMO = SUMO + OSID
          SUMD = SUMD + DSID
400       CONTINUE
          WRITE (5,325) SUMI, SLIMO, SLAAD
C
C         UNPACK GRAND TOTALS BY CARD DECK
          WRITE (5,500)
500       FORMAT (///, 1X,' CD IN OUT UNCERTAIN,,/1X,
          +36('='))
          SUMI = 0
          SUMO = 0
          SUMD = 0
          DO 600 JR = 1,NCD
          CALL GETNUM (STORE, ICD, OFF, NWORD, BITGT)
          CALL GETNUM (STORE, DCD, OFF, NWORD, BITGT)
          CALL GETNLIM (STORE, DCD, OFF, NWORD, BITGT)
          IF (ICD NE. 0) WRITE (5,275) CARD(JR), ICD, OCD, DCD
          SUMI = SUMI + ICD
          SUMO = SUMO + OCD
          SUMD = SUMD + DCD
600       CONTINUE
          WRITE (5,325) SL)MI, SLJMO, SL)MD
C
C         UNPACK GRAND TOTALS
          WRITE (5,625)
625       FORMAT (///' GRAND TOTALS')
          CALL GETNUM (STORE, IGT, OFF, NWORD, BITGT)
          CALL GETNUM (STORE, OGT, OFF, NWORD, BITGT)
          CALL GETNUM (STORE, DGT, OFF, NWORD, BITGT)
          WRITE (5,650) IGT, OGT, DGT
650       FORMAT TOTAL IN = ',I7,', TOTAL OUT = ',I7,
          +', NUMBER OF UNCERTAIN IN OUT = ',I7)
C
C         UNPACK TOTALS BY DS
          WRITE (5,675)
675       FORMAT (///' TOTALS BY DUPLICATE STATUS',//SX,
          +' DS TOTAL',/5X,12('=,))
          SUMDS = 0
          DO 700 JR = 1,NDS
          CALL GETNUM (STORE, ODS, OFF, NWORD, BITGT)
          J = JR – 1
          WRITE (5,685) J, ODS
685       FORMAT (SX,I3,I7)
          SUMDS = SUMDS + ODS
700       CONTINUE
          WRITE (5,725) SUMDS
725       FORMAT (SX,12('='),/8X,I7)
C
C         UNPACK QC INVENTORIES
          DO 800 JC = 1,CQC
          DO 775 JR = 1,RQC
          CALL GETNUM (STORE, INVNF(JR,JC), OFF, NWORD, BITGT)
775       CONTINUE
800       CONTINUE
          CALL PRINVN (BOX10)
          GO TO 900
```

```
      ENDIF
      GO TO 100
      ENDIF
900   REWIND IU
      REWIND JU
      REWIND DU
      END
C
C
C
      SUBROUTINE GETNLIM (STORE, NLJM, OFF, NWORD, BITS)
C
C     UNPACK NUMBER, UPDATE OFFSET. IF THE UNPACKED NUMBER
C     IS THE MAXIMUM SIZE FOR NUMBER OF BITS, UNPACK THE NEXT
C     NUMBER AND SUM THEM.
C     STORE – ARRAY TO UNPACK NUMBER FROM
C     NUM – RESULTANT NUMBER
C     OFF – OFFSET
C     NWORD – WORD OF ARRAY STORE TO UNPACK FROM
C     BITS – NUMBER OF BITS TO UNPACK FROM STORE
C
      IMPLICIT INTEGER (A–Z)
C
      DIMENSION STORE
C
      NUM = 0
100   CALL GBYTE (STORE(NWORD), N, OFF, BITS)
      OFF = OFFSET (OFF, NWORD, BITS)
      NUM = NUM + N
      IF (N GE. (2**BITS – 1)) GO TO 100
      END
C
C
C
      INTEGER FUNCTION OFFSET (OFF, NWORD, BITS)
C
C     UPDATE OFFSET AND NWORD BY BITS
C
      IMPLICIT INTEGER (A–Z)
      DATA WRDSIZ 60/
C
      OFFSET = OFF + BITS
      IF (OFFSET GE. WRDSIZ) THEN
      OFFSET a OFFSET – WRDSIZ
      NWORD z NWORD + 1
      ENDIF
      END
C
C
C
      SUBROUTINE PRINVN (BOX10)
C
C     PRINT QC INVENTORIES
C
      IMPLICIT INTEGER (A–Z)
      CHARACTER FLAG (14)*8
```

```
C
          COMMON /QC/ INVNF (14,11)

          DATA FLAG /'SHIP POS','WIND ','PRES WX ','PAST WX
          + 'PRESSURE','DRY BULB','WET BULB','DEW PT ','SEA TEMP',
          + 'CLOUDS ','WAVES ','SWELLS ','P TEND

          WRITE (5,10) BOX10
10        FORMAT (///,' QUALITY CONTR01 FLAGS, BOX10 = ',I3,
          +/1X,'FLAG/VALUE',3X,'MISSING',7X,'R',9X,'A',9X,'B',9X,
          +'J', 9X,'K', 9X, 'L', 9X, 'M', 9X, 'N', 9X, 'Q', 9X, 'S', 5X,
          +'TOTAL')
          DO 230 JR 1,14
          TOTAL = 0
          DO 220 JC 1,11
          TOTAL = TOTAL + INVNF(JR,JC)
220       CONTINUE
          WRITE (5,225) FLAG(JR),(INVNF(JR,JC),JC=1,11),TOTAL
225       FORMAT (IX,A,12I10)
230       CONTINUE
          END
```

```
C          CONVERTED BY CONVRT: TSCON.01B
           SUBROUTINE READER(UNIT,TARGET)
C          READ LANDLOCKED BOX2 MAP INTO OTARGET(16202)
C          FROM INTEGER & UNIT.
C          1H. = LAND
C          1H* = COASTAL
C          1H = SEA
C          REVISION HISTORY
C          LEVEL  AUTHOR  DATE       DESCRIPTION
C
C          .01A.  SDW     85/02/15.  ORIGINAL VERSION TAKEN FROM LLLIBS.01J.
C          .01B.  SL      85/02/15.  REPLACE ALL R1 FORMAT DESCRIPTORS WITH
C                                    A1. REMOVE CONVERT TO INTEGER ENTRY.
C                                    REMOVE ALL END= FROM READ STATEMENTS.
C                                    REVISED COMMENTS. CONVERT FROM
C                                    TIMESHARING FORTRAN.
C
           IMPLICIT INTEGER(A–E,G–Z)
           DIMENSION TARGET(16202)
C          READ, 0TARGET WILL REMAIN IN A1 WITH NO CONVERSION
           READ(UNIT,100) TARGET(L)
100        FORMAT(///,6X,A1)
           DO 300 KLAT=1,90
           KLON1=(KLAT–1)*180+2
           KLON2=KLON1+89
           READ (UNIT,200) (TARGET(I), I=KLON1,KLON2)
200        FORMAT (6X,90A1)
300        CONTINUE
           READ(UNIT,350)
350        FORMAT(3(/))
           DO 500 KLAT=1,90
           KLON1=(KLAT–1)*180+92
           KLON2=KLON1+89
           READ(UNIT,200) (TARGET(I),I=KLON1,KLON2)
500        CONTINUE
           READ(UNIT,600) TARGET(16202)
600        FORMAT(95X,A1)
           END
```

Comprehensive Ocean–Atmosphere Data Set; Release 1
Supplement I: Long Marine Report Conversions

0. Introduction

This is a collection of background details for the conversion to LMR (supp. F) from various character–based formats, and for the conversion back into TD–1129(M). The common characteristics and incompatibilities of the various formats in TD–11 and the Exchange format are discussed in sec. 1, as background for the design of LMR. In sec. 2, extensive corrections that were made to correct known data problems and other details of the conversion into LMR are given. Finally, sec. 3 defines changes made in the conversion from LMR back into TD–1129(M).

1. Long Marine Report Background

Brief format layouts give the primary fields in TD–11 (Tape Deck–11); more specific information on TD–11, including the representation of data within fields., will be found in [5], [6], and [7]. Different versions of the Exchange format are described in more detail since documentation of these was not readily available.

1.1 TD–11

TD– 11 formats can be grouped into three classes:

1) TD–1100
2) TD–1127
3) TD–1129(M)

These trace sequentially the evolution of the format through time in response to changing observational methods. often as a result of differing WMO code conventions, and a desire (perhaps unrealistic) to arrive at a single format suitable for all such data. The following discussions of each class include lists of data sets processed from each class.

TD–1100

Data sets processed: Atlas. HSST Pacific, Old TDF–11 Supplement B –C , Monterey, Telecom., OSV, MSQ 486 and 105 Omissions, NODC Surface, OSV Z.

The original TDF–11 (Tape Data Family–11) now called TD–1100, comprises at least 18 distinct sub–formats, linked by tape deck number "11xx" to a source card deck "1xx." Exceptions are that tape deck 1181 describes card deck 281, and later additions such as card decks 555 and

891 cannot fit this pattern either. Report length is 140 characters, but a variable number of characters at the end could be blank depending on sub–format. The form of any member of TD–1100 can be expressed by

$$\text{location} = 1\text{–}26(26) + \text{regular}_1\ 27\text{–}77(51) + \text{Irregular}_1\ 78\text{–}140(63).$$

This notation shows the start position i, end position j, and length k of sections as given by ”section = i–j(k)”, which when concatenated (”+”) depict the whole format. The format layout is given by Table I1–1 .

Table I1-1
TD-1100 Format

Field number	Char position	Description
1	1-3	card deck
2	4-6	10 ° Marsden Square
3	7-8	1 ° Marsden sub-square
4	9	quadrant (1-4)
5	10-12	latitude (degrees N, S)
6	13-16	longitude (degrees E, W)
7	17-20	year
8	21-22	month
9	23-24	day
10	25-26	hour (GMT)
11	27-29	wind direction and indicator (code)
12	30-33	wind speed and indicator (knots)
13	34-36	visibility and indicator (code)
14	37-38	present weather (code)
15	39	past weather (code)
16	40-44	sea level pressure (mb)
17	45-48	temperature indicator and air temperature (° C)
18	49-51	wet bulb temperature (° C)
19	52-54	dew point temperature (° C)
20	55-57	sea surface temperature (° C)
21	58-60	air-sea temperature difference (° C)
22	61	total cloud amount (oktas)
22	62	lower cloud amount
22	63	type of low cloud
22	64	cloud height indicator
22	65	cloud height
22	66	type of middle cloud
22	67	type of high cloud
23	68-69	direction of waves (code)
24	70	period of waves (code)
25	71-72	height of waves (1/2 meters)
26	73-74	direction of swell (code)
27	75	period of swell (code)
28	76-77	height of swell (1/2 meters)
29	78-79	ocean weather station number or country code
30	80	card indicator
31	81	ship type
32	82	additional data indicator
33-36	83-88	additional data
37	89	ice indicator
38	90-93	ship number
39	94-140	supplemental data

Within $irregular_1$ the positions 78–81(4) and 89–93(5) are themselves regular for all sub-formats; these subsections will be denoted $standard_1$, and $standard_2$, respectively. Positions 82–88(7) contain additional data, whose contents depend on the indicator in position 82. Finally, positions 94–140(47) contain supplemental data whose contents depend on the subformat. Thus irregular1 takes the overall form

standard1 = 78–81(4) + additional = 82–88(7) + standard $_2$ = 89–93(5) + supplemental 94–140(47).

The supplemental section is used to preserve the original units or form of fields whose conversion might be open to question, or which are unique to a sub-format. Table I1–2 shows the (supposedly) non-blank length of supplemental for each of 17 sub-formats.

Table I1–2
Supplemental Length

Tape deck	Card deck	Supplemental = 94–	Trailing blanks
1110	110	140(47)	0
1116	116	120(27)	20
1115	118	118(25)	22
1119	119	112(19)	28
1128	128	101(8)	39
1181	281	134(41)	6
1184	184	112(19)	28
1185	185	100(7)	40
1187	187	119(26)	21
1188	188	97(4)	43
1189	189	116(23)	24
1192	192	136(43)	4
1193	193	116(23)	24
1194	194	120(27)	20
1195	195	113(20)	27
1196	196	126(33)	14
1197	197	125(32)	15

TD–1127

Data set processed: ’70s Mislocated Data.

Tape Deck–1127 has the general form

location = 1–26(26) + $regular_1$ = 27–77(51) + $regular_2$ 78–140(63),

where $regular_2$ takes the place of $irregular_1$ in TD–1100. Quality flags have been added and the format of $regular_2$ is invariant, regardless of deck number. Also, the call sign is usually used in place of ship number. Table I1–3 gives the format layout.

Table I1-3
TD-1127 Format

Field number	Char position	Description
1	1-3	card deck
2	4-6	10 ° Marsden Square
3	7-8	1 ° Marsden sub-square
4	9	quadrant (1-4)
5	10-12	latitude (degrees N, S)
6	13-16	longitude (degrees E, W)
7	17-20	year
8	21-22	month
9	23-24	day
10	25-26	hour (GMT)
11	27-29	wind direction and indicator (code)
12	30-33	wind speed and indicator (knots)
13	34-36	visibility and indicator (code)
14	37-38	present weather (code)
15	39	past weather (code)
16	40-44	sea level pressure (mb)
17	45-48	temperature indicator and air temperature (° C)
18	49-51	wet bulb temperature (° C)
19	52-54	dew point temperature (° C)
20	55-57	sea surface temperature (° C)
21	58-60	air-sea temperature difference (° C)
22	61	total cloud amount (oktas)
22	62	lower cloud amount
22	63	type of low cloud
22	64	cloud height indicator
22	65	cloud height
22	66	type of middle cloud
22	67	type of high cloud
23	68-69	direction of waves (code)
24	70	period of waves (code)
25	71-72	height of waves (1/2 meters)
26	73-74	direction of swell (code)
27	75	period of swell (code)
28	76-77	height of swell (1/2 meters)
29	78-79	country code
30	80	ship direction (code)
31	81	ship speed (code)
32	82	barometric tendency (code)
33	83-85	amount of pressure change (mb)
34	86	type of ice accretion on ship (code)
35	87-88	thickness of ice on ship (cm)
36	89	rate of ice accretion (code)
37	90-96	ship, OSV, or buoy call sign
38	97	original wind speed units indicator
39	98	original temperature units indicator
40	99	sea temperature measurement method indicator
41	100-101	wind wave period (seconds)
42	102	description of ice type (code)
42	103	effect of ice on navigation (code)
42	104	bearing of principal ice edge (code)
42	105	distance to ice edge from ship (code)
42	106	orientation of ice edge (code)
43	107-108	amount of precipitation (code)
43	109-110	time period for precip. amount (code)
44	111	significant cloud amount (code)
45	112	significant cloud type (code)
46	113-114	significant cloud height (code)
47	115	ship position - flag

Table I1-3 (continued)

Field number	Char position	Description
48	116	wind - flag
48	117	visibility - flag
48	118	present weather - flag
48	119	past weather - flag
48	120	pressure - flag
48	121	air temperature - flag
48	122	dew point/wet bulb - flag
48	123	sea surface temperature - flag
48	124	cloud - flag
48	125	wave - flag
48	126	swell - flag
48	127	pressure change - flag
49	128-129	quality code
50	130-134	Julian date (year, day) of QC
51	135-136	blank
52	137-140	reserved for NCDC use only

TD–1129(M)

Data sets processed: Eltanin, Japanese, South African Whaling, Australian, IMMPC, ’70s Decade, Buoy Data.

This format is intended to replace both TD–1100 and TD–1127 as an all purpose character–based marine format. TD–1129 is for recent data, and its variant TD–1129M is for old data from TD–1100 (e.g., the Eltanin and South African Whaling data sets). The notation TD1129(.N1) refers to either TD–1129 or TD–1129M. In general the form is

location = 1–26(26) + regular_3 = 27–78(52) + irregular_2 = 79–148(70).

In comparison with $regular_1$, overpunches have been eliminated and the air–sea temperature difference has been dropped from $regular_3$, so that its contents are essentially equivalent to $regular_1$ Table I1–4 gives the format layout for TD–1129.

Table I1-4
TD-1129 Format

Field number	Char position	Description
1	1-3	card deck
2	4-6	10° Marsden Square
3	7-8	1° Marsden sub-square
4	9	quadrant (1-4)
5	10-12	latitude (degrees N, S)
6	13-16	longitude (degrees E, W)
7	17-20	year
8	21-22	month
9	23-24	day
10	25-26	hour (GMT)
11	27	wind direction indicator
11	28-29	wind direction (code)
12	30	wind speed indicator
12	31-33	wind speed (knots)
13	34	visibility indicator

Table 11-4 (continued)

Field number	Char position	Description
13	35-36	visibility (code)
14	37-38	present weather (code)
15	39	past weather (code)
16	40-44	sea level pressure (mb)
17	45	temperature indicator
17	46-49	air temperature (°C)
18	50-53	wet bulb temperature (°C)
19	54-57	dew point temperature (°C)
20	58-61	sea surface temperature (°C)
21	62	total cloud amount (oktas)
21	63	low or middle cloud amount
21	64	type of low cloud
21	65	cloud height indicator
21	66	lowest cloud height
21	67	type of middle cloud
21	68	type of high cloud
22	69-70	direction of waves (code)
23	71	period of waves (code)
24	72-73	height of waves (1/2 meters)
25	74-75	direction of swell (code)
26	76	period of swell (code)
27	77-78	height of swell (1/2 meters)
28	79-80	country code
29	81	ship direction (code)
30	82	ship speed (code)
31	83	barometric tendency (code)
32	84-86	amount of pressure change (mb)
33	87	type of ice accretion on ship (code)
34	88-89	thickness of ice on ship (cm)
35	90	rate of ice accretion (code)
36	91-97	ship, OSV, or buoy call sign
37	98	original wind speed units indicator
38	99	original temperature units indicator
39	100	sea temperature measurement method indicator
40	101-102	wind wave period (seconds)
41	103-104	swell wave period (seconds)
42	105	concentration of ice (new code 1982)
		description of ice type (code)
		stage of ice development (new code 1982)
42	106	effect of ice on navigation (code)
42	107	bearing of principal ice edge (code)
		ice of land origin (new code 1982)
42	108	distance to ice edge from ship (code)
		situation and trend (new code 1982)
42	109	orientation of ice edge (code)
43	110-111	amount of precipitation (code)
43	112-113	time period for precip. amount (code)
44	114	significant cloud amount (code)
45	115	significant cloud type (code)
46	116-117	significant cloud height (code)
47	118	second past weather (code)
48	119-120	second swell direction (code)

Table I1-4 (continued)

Field number	Char position	Description
49	121-122	second swell period (seconds)
50	123-124	second swell height (1/2 meters)
51	125	ship position - flag
52	126	wind - flag
52	127	visibility - flag
52	128	present weather - flag
52	129	past weather - flag
52	130	pressure - flag
52	131	air temperature - flag
52	132	wet bulb temperature - flag
52	133	dew point temperature - flag
52	134	sea surface temperature - flag
52	135	cloud - flag
52	136	wave - flag
52	137	swell - flag
52	138	pressure change - flag
53	139-140	quality code
54	141-142	QC - year
54	143-144	QC - month
55	145	indicator for wave measurement (1982 code)
56	146	source of observation on card (1982 code)
57	147	observation platform (1982 code)
58	148	source ID (A-X corresponds to 1-24 in LMR)

For recent data (TD–1129), irregular$_2$ assumes the invariant form shown in Table I1–4 , which accommodates recent WMO code changes at the expense of adding seven characters.

(One character is also added to $regular_3$ so the report length is eight characters longer.)

For older data (TD–1129M), $irregular_2$ contains information that is practically equivalent to that contained in $irregular_1$, according to the following transformation.

a) $Standard_1$ data 78–81(4) in TD–1100 move to 79–82(4) in TD–1129M.

b) Additional data 82–88(7) move to 141–147(7).

c) $Standard_2$ data 89–93(5) move to 83–87(5).

d) Supplemental data 94–140(47) move to 88–124(37).

Clearly, depending on the sub–format, Supplemental data may not all fit. Decks 110, 117, 281, 192, 150, 151, and 152 require special treatment:

- deck 110

  Supposedly, $standard_1$ and $standard_2$ are always blank in this deck. Omitting a presumably useless hundreds position of relative humidity in the first character (making 0 and 100,:;c equivalent), the remaining supplemental data move instead to 79–124(46).

- deck 117

  Similarly omitting the hundreds position of relative humidity in the first character, supplemental data move to 88–124(37).

- decks 281, 192, 150. 151, and 152

  Since these have shorter supplemental data, and a $standard_1$, and $standard_2$ that are also

  supposed to be blank. supplemental data can move to 79–124(46) without omitting the first character.

In practice, these special transformations do not work as stated because supplemental, $standard_1$, and $standard_2$ often contain undocumented or erroneous characters. Some of these characters were ”area codes” assigned for special Atlas studies or they were dates when data were added to a data base at NCDC.

1.2 Exchange Format

The United States, Germany (F.R.G.), the Netherlands, and the United Kingdom apparently used this as the format for exchange of reports gathered in the Historical Sea Surface Temperature (HSST) Data Project. In order to minimize processing, data from the German and Netherlands areas of responsibility (Atlantic and Indian Oceans) were translated from the Exchange format directly into LMR, even though a TD–1100 transcription was available from NCDC. For the United States area of responsibility (Pacific Ocean), the TD–1100 was used because it contained additional data not available in the Exchange format.

The Exchange format obtained (Table I1–5) is considerably shorter (46 characters) than any class of TD–11. The format differs slightly depending on which country provided a report (no details were available on the U.K. format), and each area of responsibility contains data merged together from the four countries. Although source ID (and card deck) identify the area of responsibility no identifier is available in the Exchange format showing which country provided a report. For translation to LMR, a special supplemental was defined for this format (later subject to special treatment as described for deck 152 in translation from LNIR to TD1129M). Characters from columns 33–35 and 42–46 were saved in the supplemental attachment. This includes the wind speed and all flag information from the original format, as shown in Table I1–5 .

Table 11-5
Exchange Format

Field number	Char position	Description
1	1-1	octant

S. Hemisphere	N. Hemisphere	Longitude
5	0	0-90 ° W
6	1	90-180 ° W
7	2	180-90 ° E
8	3	90-0 ° E

Field number	Char position	Description
2	2-3	10 ° square (tens digit of latitude and longitude)
3	4-5	month
4	6-9	year
5	10-11	latitude (units and tenths digit)
6	12-13	longitude (units and tenths digit)
7	14-15	day
8	16-17	hour (GMT)
9	18-21	sea surface temperature
10	22-25	air temperature
11	26-29	wet bulb temperature in tenths of a degree Celsius, or replaced by 999 if missing, with the sign as the first position. In the U.S. and Netherlands formats the sign is blank if the value is positive. In the German format the sign is "+", "−", or "E" (the latter used only for wet bulb with ice).
12	30-32	wind direction in whole degrees from north (converted from other units if necessary) with 000 for calm, 990 for variable, or 999 for missing.
13	33-35	wind speed in tenths of a meter per second (converted from other units if necessary) with 999 for missing.
14	36-40	sea level pressure in tenths of a millibar, with 99999 for missing.
15	41	total cloud amount in oktas, with 9 for obscured, or blank for missing. In the U.S. and Netherlands formats, missing occurs with f-sus2 (field 20) of 2, 3, 6, or 7.
16	42	f-sea U.S. and Netherlands formats only, flag for measurement precision of sea surface temperature and the state of the wet bulb. Codes 0 to 9: Codes 0 to 4 (Netherlands for frozen wet bulb); codes 5 to 9 for unfrozen wet bulb, even when showing temperature below freezing point (or Netherlands wet bulb temperature missing):

Code	Code	Precision
0	5	0.1 ° F
1	6	0.1 ° C
2	7	0.5 ° F
3	8	0.5 ° C
4	9	1 ° F or 1 ° C

Field number	Char position	Description
17	43	f-air U.S. and Netherlands formats only, flag for measurement precision (as given by f-sea) of air and wet bulb temperatures. Codes 0 to 9: codes 0 to 4 (Netherlands for wet bulb temperature missing); codes 5 to 8 for temperatures measured by an aspirated or whirling psychrometer; code 9 for original units or precision of temperatures unknown.
18	44	f-wind Flag for wind observation. Codes 0 to 9: codes 0 to 4 indicate wind speed measured; codes 5 to 9 indicate wind speed estimated or converted from Beaufort force, or method of observation unknown (in the German format, only codes 1, 6,

Table I1-5 (continued)

Field number	Char position	Description
		and 7 are documented, with 6 and 7 differing by definitely indicating a conversion from Beaufort force):

Code	Code	Point compass
0	5	360
1	6	36
2	7	32
3	8	16
4	9	8

Field number	Char position	Description
19	45	f-sus1 U.S. and Netherlands formats only, flag for suspect values of sea surface and air temperatures, and wind. Codes 0 to 7:

Code	Condition
0	none of the following conditions
1	suspect sea surface
2	suspect air temperature
4	suspect wind
3,5-7	more than one value suspect, codes added together

Field number	Char position	Description
20	46	f-sus2 U.S. and Netherlands formats only, flag for suspect values of pressure, cloud amount, or additional report. Codes 0 to 7:

Code	Condition
0	none of the following conditions
1	suspect pressure
2	cloud amount not reported
4	additional report at same time in the same 1° square though not identical.
3,5-7	more than one value suspect, codes added together.

1.3 LMR

The three TD–11 classes take the following forms:

TD–1100: location = 1–26(26) + $regular_1$ = 27–77(51) + $irregular_1$ = 78–140(63)
TD–1127: location = 1–26(26) + $regular_1$ = 27–77(51) + $regular_2$ = 78–140(63)
TD–1129: location = 1–26(26) + $regular_3$ = 27–78(52) + $irregular_2$ = 79–148(70)

Note that location remains unchanged. Actually positions 1–45 are invariant. Moreover, the contents of $regular_1$ and $regular_3$ are essentially equivalent as noted previously. Thus, only the final section of each class contains variable information, and the first two sections in each can all be entered into a uniform location and regular section in LMR. Adding a control section and an irregular section at the end completes the format as described fully in supp. F .

2. Corrections and Conversion into LMR

A number of known data problems were corrected at the conversion into LMR, and prior to sorting the data as required by duplicate elimination. These and other conversion details given here impact the LMR, and in some cases also apply to the TD–1129(M). See supp. K for a description of earlier changes made in the translation from miscellaneous formats (e.g., Japanese, Australian) into TD–11, performed at NCDC.

2.1 Character Translation Tables

Some possible overpunch–numeric combinations can result in confusing character conventions. Therefore, the following conventions were always used. For the most part, these are consistent with the most commonly used conversions.

12 overpunches and numbers 1–9 map to letters A–I.
11 overpunches and numbers 1–9 map to letters J–R.

These letters are well defined in all character sets. In the supplemental attachment, ebcdic is used to represent the letters A–Z, and special characters translate into the ship character set as shown in Table I2–1 .

Table I2–1
Translation into Ship Characters

026 punch code	ebcdic		ascii		CDC dpc		Ship
	Hex	Char	Hex	Char	Octal	Char	Hex
12–0	C0/4C	{/<	7B/3C	{/<	72	<	C0
11–0	D0/4F	}/|	7D/21	}/!	66	!	D0
12	4E	+	2B	+	45	+	CB
11	60	–	2D	–	46	–	DA
0–8–7	50	&	26	&	67	&	CA
0–1	61	/	2F	/	50	/	E1
12–8–4	5C	*	2A	*	47	*	EA

2.2 Watch Number to Hour

For deck 194, if watch number was 6, 1 was added to the day (and month/year if applicable), and watch number was changed to 9.

2.3 Hour

Any time hour was 24, 1 was added to the day (and month/year if applicable), and hour was changed to 00. An hour of 99 was considered missing.

2.4 Pre–July 1963 Wave Fields

Applicable to both wave and swell data* before July 1963 (exclusive):

* Prior to the code change of 1 July 1963, only the higher of the (wind) wave and swell was reported. Standard practice at NCDC was to put this into the wave (not swell) fields.

a) If 51 ≤ direction ≤86, then direction = direction – 50 and height = height + 10.

b) If direction equals 99 and height < 10, then height = height + 10.

2.5 Cloud, Wave, and Swell Fields

Sometimes / was keyed in place of – in fields where – was a legal value, and / or – were keyed in place of space (S) when the cloud or wave fields were missing. Specifically:

a) Cloud Fields. (& was also keyed in place of –.) These two steps were used to determine if the LMR cloud fields C, NH, CL, HI, H, CM, CH were all missing.

i) Any / or & changed into –.

ii) If all seven positions were then S or – in any combination, then all seven fields were considered missing and were changed into SSSSSSS.

Otherwise – was changed into S in fields where – was not legal (C, NH, HI).

b) Wave and swell fields were all missing if they fit one of these 5–character patterns:

i) SSSSS
ii) -----
iii) /////

and were all changed into pattern i) In addition, waves only (not swells) were all missing if they fit one of these 5–character patterns (which include i)–iii) as special cases):

iv) DDSSS
v) DD---
vi) DD///

where D is any character. That is, if the last three characters were SSS,---, or this field was changed into pattern i).

2.6 Indicators Referring to Missing Data

Non–blank indicators referring to blank (missing) data were made blank:

a) Wind direction indicator if direction was blank.
b) Wind speed indicator if speed was blank.
c) Visibility indicator if visibility was blank.
d) Temperature indicator if all of the temperature fields were blank.
e) Cloud height indicator if cloud height was blank.

This rule does not apply to indicators that refer to erroneous data.

2.7 Time/Space Location Errors

Reports with errors or inconsistencies in time or geographical location were written out to a reject file for later work. For reports in which the Marsden Square disagrees with quadrant, latitude, and longitude (or the corresponding inconsistencies in Exchange format data), both the 10° box and 1° MSQ should be recomputed and the report relocated accordingly, when time permits. This was done for a few of the smaller data sets.

2.8 Card Deck Assignments

The following new card decks were assigned during this project:

```
*    155 HSST Indian      (Boulder
*    156 HSST Atlantic     conversion)
     897 Eltanin
*    898 Japanese (change from 926)
     899 S. African
     900 Australian
     926 IMMPC
```

Only those decks with an asterisk (*) required action at this conversion stage, the others had been assigned during NCDC's conversions. NCDC assigned 154 to its conversion of both the HSST Indian and Atlantic basins.

2.9 Monterey Telecom. Pre-processing

Owing to the questionable quality of this data set, checks were made for the following conditions:

a) Positions 70-77 (period and height of sea; direction, period, and height of swell) equal to -0031000.

b) Present weather missing (blank) when past weather was any nonblank character.

c) Calm wind direction when speed was greater than or equal to 7 knots.

Any report with one or more of a)-c) true was written to a reject file. This was expected to eliminate most hard duplicates (supp. K) internal to the Monterey Telecom.

2.10 Existing Ship Type

Only TD-1 100 inputs had a field for ship type, to which these changes were made:

a) For any decks. a ship type of 2 with a negative overpunch was converted to 3 in order to help eliminate overpunches from the format. Subsequently. ship type was set to 2 if not 2 or 3 for source IDs 8, 9, and 20 (OSV data).

b) For source IDs 2 and 7 (HSST Pacific and Monterey Telecom.), ship type was set to missing.

c) For deck 891, a ship type of 6 was intended to indicate a research ship (or SD, meaning station data) but was inadvertently assigned to every report in this deck, including bathythermographs (XBT and N4BT), during the translation into TD–11. Position 103 was expected to contain the type. Thus,

if type = 1 (MBT) then ship type = 7;
if type = 2 (XBT) then ship type = 7;
if type = 3 (SD) then ship type = 6.

If type was not one of these values, tests were made for the presence of the weather elements sea surface temperature, air temperature, pressure, and wind (speed and direction). If only, sea surface temperature was extant, the ship type was changed to 7; otherwise ship type was left 6 to indicate a research ship.

2.11 Derived Ship Type

Inputs other than in TD–1100 did not have a field for ship type. Data in the Exchange format had no form of ship identification, so ship type became missing. For data in TD–1129M, ship type was set to 6 for Eltanin data, or else it was set to missing. For data in TD–1127 and TD–1129, ship type was set to missing with two exceptions for buoy data: a) ’70s Decade or ’70s Mislocated Data (source IDs 18 and 23) had ship type set to 5 if deck was 143 or 876–886; b) for source ID 24 ship type was automatically set to 5.

2.12 Past Weather Containing Overpunch

A negative overpunch with a numeric past weather was stripped off and the numeric retained in decks 151, 192, and 899.

2.13 Wind Speed Conversion from Knots to Meters Per Second

Decks 128, 150, 151, 152, 185, and 926 have been identified as cases in which some or all of the original wind speeds were translated from meters per second into whole knots to fit in TD11. The international convention (1 m s^{-1} = 1.9438445 knot) was used to convert all decks back to meters per second, regardless of the fact that the U.S. convention (1 m s^{-1} = 1.94254 knot) was probably used for the reverse conversion in the six decks; this was done because of a lack of complete documentation -- the problem should be fixed later.

2.14 19th Century IMMPC

These were all changed to the corresponding year of the 20th century because manual inspection showed 19th century reports always to be adjacent, with a sharp break, to reports in the 20th century.

2.15 Japanese Wind Direction

These special characters were changed when encountered in the high-order position of the wind direction in the Japanese data.

! changed into 0,
w changed into 1,
u changed into 2,
v changed into 3.

In addition, when one of the three (lower-case only) letters was encountered, 100 was subtracted from the wind speed. (Original wind speeds less than 100 were considered erroneous.)

2.16 South African Minus Sign

Any field in the "regular" section that contained all minus signs (-), and for which "all minus signs" was not a legal value, was made blank.

2.17 Bucket Indicator

Only in TD-1129 was there a bucket indicator in the "regular" section, and only in the Australian set was there a value, 9, for a missing indicator. A blank in this Field was interpreted as missing, except in the Australian set, where it was interpreted as intake.

2.18 Australian '70s

This set had WMO-defined quadrant numbers. These were translated into the quadrant system used by NCDC according to the following:

WMO	NCDC
3	4
5	3
7	1
1	2

2.19 Wet Bulb With Ice In the German Exchange Format

At conversion time the sign character (E), which specified wet bulb with ice, was unknown, so that all wet bulb temperatures containing a character other than a blank, plus, or minus were considered erroneous.

2.20 Temperature Indicator

This indicator has a different meaning for source TD-11 data versus source Exchange data. In TD-11, the only legal values correspond to T1 = 0, 1, or 2 (0.1° C, 1° C, or 0.5° C). Data converted from 0.1° F, 1° F, or

0.5° F were set at NCDC with T1 = 0 to indicate that the tenths position of temperature, after conversion, might be any digit (e.g., not constrained to 0 or 5).

In contrast, the Exchange format has a flag with possible values for original measurement precision of 0.1° F, 0.1° C, 0.5° F, 0.5° C, and 1° F or 1° C. No allowance was made for mixed precision among the different variables or the state of the wet bulb as given by the Netherlands version of the Exchange format. When mixed precision was indicated, or precision of 1° F or 1° C, TI was set to missing.

3. Conversion from LMR into TD–1129(M)

For some recent data (TD–1129 or TD–1129M) this step reversed the conversion into LMR, except that corrections and modifications made at that stage were retained. However, most of the data required rearrangement of fields or other modifications to achieve a more uniform format. These transformations are covered in the background on TD–1129(M) in sec. 1.1. Additional details are given here.

3.1 Bucket Indicator

A missing indicator, and the values for unknown and implied bucket (BI codes 0 and 2) were all translated into 0 in TD–1129.

3.2 Uncertain Duplicates

Only reports with a dup status strictly less than 3 were converted into TD–1129(M), which eliminated all uncertain duplicates as defined in supp. K .

3.3 Undocumented Supplemental Data

Undocumented fields, such as the Atlas "area code" from original positions 137–140, were not blanked out, and as many such characters as would fit were included.

3.4 Erroneous Fields and their Indicators

A non–blank indicator associated with an erroneous field was blanked out, as was the field. However, quality control nags referring to erroneous data were retained.

3.5 Leading Zeros

Numeric values were prefixed by leading zeros where necessary to fill the entire field up.

3.6 Positive Temperatures

These have an explicit plus in the sign position.

3.7 Exchange Source Wind Directions

Because the value in degrees for decks 155 and 156 (or source IDs 3 and 4) may not coincide with any of the compass midpoints chosen for a given direction indicator, as discussed in supp. F , a deviation ± 2° around the values in Table F2–1 was allowed.

3.8 Source ID

Source ID was coded as a single character (A–X) corresponding to the numeric values in use in LMR (1–24), and placed in position 148 of TD–1129(M).

3.9 Special Transfers for 1970–1979 Data Exclusive of the '70s Decade

In order to make the '70s strictly TD–1129 (not TD–1129M), special modifications were required for some source TD–1100 data. Decks 128 and 891, exclusive of the '70s Decade (i.e., not source ID 18), were modified. Tables I3–1 and I3–2 show the respective transfers made for these two decks of data from TD–1100 positions 78–140. Any data not explicitly transferred from positions 78–140 were deleted, resulting in the loss of some supplemental data from TD1129.

Table I3–1
Position Mapping for '70s Deck 128

Field	TD–1100	TD–1129
ocean weather station number or country code*	78–79	79–80
when column 82=1		
type of ice accretion on ship	83	87
thickness of ice on ship	84–85	88–89
rate of ice accretion	86	90
when column 82=6		
ship direction	83	81
ship speed	84	82
barometric tendency	85	83
amount of pressure change	86–88	84–86
when column 82=8		
significant cloud amount	83	114
significant cloud type	84	115
significant cloud height	85–86	116–117
ship number	90–93	91–94
original temperature units indicator	98	99
sea temperature measurement method indicator	99	100

wind wave period	100–101	101–102

* Not transferred if TD–1100 position 81 (ship type) was 2 or 3.

Table I3–2
Position Mapping for '70s Deck 891

Field	TD–1100	TD–1129
ship number	90–95	91–96

3.10 Overlaying of QC Flags in the '70s Decade

Because the '70s Decade data set had been previously quality controlled at NCDC, two sets of QC flags are available in LMR. In order to reconcile the two sets of flags, which are based on differing procedures, the more serious value from each pair of flags (see supp. J) was output. This will help catch those suspect or erroneous fields that NCDC failed to flag, and at the same time retain those flags received during the track check performed at NCDC.

Overlaying of flags was done only for the '70s Decade (source ID 18), not the '70s Mislocated Data (source ID 23). Except for flags R (correct) and S (missing), the flag with the higher alphabetic ranking A through Q was chosen. Flag R was always discarded in favour of any one of A through Q, and S should appear only with missing fields. In the event a new flag stated a field was missing, but the old did not, the new flag was chosen. In order to identify the quality control procedure(s) that produced the resulting flags, three different QC dates were output: a) old date if all old flags, or old and new were the same; b) June '84 if old and new mixture; or c) May '83 if all new.

Comprehensive Ocean–Atmosphere Data Set; Release 1
Supplement J: Quality Control Flowchart

0. Introduction

COADS contains data from numerous and varied sources. Reports were obtained from ship logs, ship weather reporting forms, published ship observations, automatic observing buoys, fixed platforms such as oil rigs, teletype reports, Global Telecommunication System (GTS) reports, and data on cards or magnetic tape that were acquired from foreign meteorological services.

Instrumentation varied from that found aboard a 19th Century Clipper ship to the sophisticated equipment aboard today's research vessels. Observer qualifications ranged from the deck hand with little meteorological experience to the trained meteorologist. A detailed quality control procedure was used to edit this conglomeration of widely differing data.

Each report has been selectively checked for internal consistency, extreme values, and legal codes. The results of the editing process appear as quality indicators (flags) for each element (or variable) checked. In genera), if an element had already been flagged and was flagged again, the flag indicating the greatest error severity (i.e., with the largest numerical weight as defined in the following) was retained; and a flagged element was not used in determining if another variable should be flagged.* As an example, if air temperature had been flagged as erroneous, then present weather was not flagged because of that air temperature value. Any suspect or erroneous data found were left unchanged and only flagged in this quality control process, although some data corrections were made beforehand (see supps. I and K).

* NOTE: a report with ship position nagged erroneous (e.g., landlocked) was also subjected to all other Possible checks, and thus individual weather elements such as sea surface temperature may contain an unreliable flag.

The quality control subroutine (QC) is an important part of the duplicate elimination program (described in supp. K) because it provided a measure, in the form of a quality code, to judge which report among duplicates was retained. ** The quality code assigned to each report is the sum of the weights associated with the 14 flags given by Table JO–1 , where the weight and the general meaning of each possible flag value is given by Table JO–2 .

** NOTE: A number of errors discovered in QC were corrected in subsequent reprocessing of the data after duplicate elimination and completion of the untrimmed data products. Thus some errors could have influenced the selection of duplicates, and affect the untrimmed products to a largely unknown extent (see supp. E). The description given here describes the net effect of the QC that was originally performed plus the corrections done afterwards, with a few minor exceptions such as the following: 1) When negative dew point temperatures were recomputed because of roundoff errors in Australian (deck 900) and HSST Exchange (decks 155–156) data, side–effects on flags were minimized by not completing recomputation unless the new dew point was exactly 0.1 C colder than the old one. One possible side–effect is that the L and Q flags, for data outside long–term climatological limits $\bar{x}$ 4.8σ and $\bar{x}$ 5.8σ , may no longer be strictly correct. 2) During corrections in which wind direction was temporarily substituted into a missing wave direction, wave fields (direction, period, and height) containing erroneous characters were treated as if the)were missing, but would not be treated as such with a revised QC.

It should be noted that the design of the QC will have to be altered to handle observations starting in 1982. when again new coding procedures were introduced.

Table J0–1
Possible QC Flag Values

Abbrev.	Flag	R	A	B	J	K	L	M	N	Q	S
		flag values (X)									
shipf	ship position	X				*		X			
windf	wind	X	X		X			X		X	X
visf	visibility	X						X			X
prswXf	present weather	X		X	X		X	X			X
pstwXf	past weather	X			X			X			X
pressf	pressure	X				*	X	X		X	X
dryf	air temp.	X			X	*	X	X	X	X	X
wetf	wet bulb temp.	X		X		*	X	X	X	X	X
dewf	dew point temp.	X		X		*	X	X	X	X	X
seaf	sea surface temp.	X				*	X	X		X	X
cloudf	cloud	X	*	X	X				X		X
seawvf	wave	X	X	X	X			X	X	X	X
swlwvf	swell	X		X	X			X	X	X	X
ptendf	pressure tendency	X				X		X			X

* Additional possible flag values in TD– 1129 for data in the period 1970–1979 because of flag overlaying (mm sec. 1).

Table JO–2
QC Flag Meaning

Value*	Coded**	Weight	Meaning	Reason
R	1	0	correct	--
A	2	1	correctable	legality
B	3	1	correctable	internal consistency
J	4	2	suspect	internal consistency
K	5	2	suspect	time
L	6	2	suspect	extreme (outside $\bar{x} \pm 4.8\sigma$)
M	7	3	erroneous	legality
N	8	3	erroneous	internal consistency
Q	9	3	erroneous	extreme (outside $\bar{x} \pm 5.8\sigma$)
S	10	3	missing	--

*Alphabetic representation in TD–1129(M).

**Numeric representation in LMR (see supp. F).

1. Effects of Previous Quality Control

For data in the period 1970–1979, at least the ’70s Decade data set (source ID 18) had been previously quality controlled by NCDC using a process similar to that described here. In the later years (from May 1973 on) when individual ships could be identified, some track checks were conducted for unbroken series of reports (i.e., when the interval between reports was less than 24 hours). Table J1–1 describes the procedure used.

Table J1-1
Previous '70s Decade Track Checks

1) Ship position flag set to K if either an applicable limit on change in longitude, depending on latitude position, or the limit on change in latitude are exceeded:

Longitude change limit (degree/hour)	Latitude position (X)
0.7	$0 \leqslant \lvert X \rvert \leqslant 39.9$
1.0	$40 \leqslant \lvert X \rvert \leqslant 49.9$
1.4	$50 \leqslant \lvert X \rvert \leqslant 59.9$
2.0	$60 \leqslant \lvert X \rvert \leqslant 69.9$
2.7	$70 \leqslant \lvert X \rvert \leqslant 75.0$
Latitude change limit (degree/hour)	
0.7	

2) Ship position flag set to K in two or more reports with the same call sign and same time but different positions. If the ship positions are within 0.5° in both latitude and longitude, change the flag to C for a report with the lowest quality code (ties are handled by the arbitrary selection of one report to receive the C).

3) The following individual elements are flagged K if they show a change greater than the indicated value:

sea level pressure	5 mb/hour
air temperature	5 °C/hour
dew point/wet bulb temperature	5 °C/hour
sea surface temperature	3 °C/hour

Also,it should be noted that a few elements flagged "correctable" by the previous '70S Decade quality control were slightly modified at that time and carried forward. Otherwise the practice at NCDC, starting with data observed in 1970, has been to leave suspect or erroneous data unchanged.

Both the new and old sets of flags are available in LMR, but there is room for only one set of flags in TD-1129. Therefore, the two sets of flags were overlaid in TD-1129 as given in supp. I .

Prior to the 1970-79 period, the data came mostly from the Atlas (source ID 1). which had also been through an earlier editing process A-here some elements had been changed or eliminated during the quality control, including some creation of composite reports.* For most Atlas data, the flags assigned in the latest quality control will either be an S (missing) or an R (accepted as a valid element), as most of the inconsistencies were corrected during that first edit.

* See supp. K for details on a few similar substitutions between different reports that were carried out in duplicate elimination

2. Quality Control Flowchart

The following flowchart (covering 14 pages) outlines all the QC checks and conditions for flag assignment. The flags are assigned a value from Table J0-2 .

The different elements used to determine the flag values are abbreviated as follows:

y	-	latitude
wddir	-	wind direction
wdspd	-	wind speed
vis	-	visibility
preswx	-	present weather
pastwx	-	past weather
press	-	sea level pressure
dryblb	-	air temperature
wetblb	-	wet bulb temperature
dewpt	-	dew point temperature
seatmp	-	sea surface temperature
N	-	total cloud amount
Nh	-	lower cloud amount
CL	-	low cloud type
h	-	cloud height
CM	-	middle cloud type
CH	-	high cloud type
wvdir	-	wave direction*
wvper	-	wave period
wvhgt	-	wave height
swldir	-	swell direction
swlper	-	swell period
swlhgt	-	swell height

a – barometric tendency
ppp – amount of pressure change

* In their conversion of data into TD–11, NCDC usually substituted wind direction into missing (wind) wave direction since 1 January 1968, when wave direction was no longer ordinarily reported. Instead of continuing this practice, a temporary substitution of wind direction into missing wave direction was made during QC of the wave fields. Afterwards, the wave direction was left missing, thereby preserving any remaining information regarding whether it was separately reported. Note: this same procedure was followed for buoys, although they measure only height and period without discriminating between wave and swell (NCDC placed this information in wave fields).

The order of these variables corresponds to that given in supp. F , which also contains a section describing the possible flag values and details on the representation of the flags in LMR. Barometric tendency and amount of pressure change are available only in the supplemental attachment for data converted into LMR from formats TD–1100 (when the additional data indicator is 6), TD–1127, and TD–1129.

The wave or swell variables or flags are occasionally abbreviated generically,as follows:

dir – wave or swell direction
per – wave or swell period
hgt – wave or swell height
wvf – wave or swell flag

The process so abbreviated is applied identically to both waves and swells.

The following are additional abbreviations:

MISS – missing value
n – number of observations in 5 and or
$\bar{x}$ – mean
σ – standard deviation

MISS is a legitimate value for any variable to indicate that it was missing. The mean and standard deviation are 5° latitude x 5° longitude long–term monthly values for selected variables, which were obtained together with the 1° Marsden Square landlocked table from NCDC. These were used to check for extreme values –– but only when the associated number of observations was 25 or more. Therefore, these checks were not made in regions of sparse data, such as high latitudes.

Four symbols make up the flowchart:

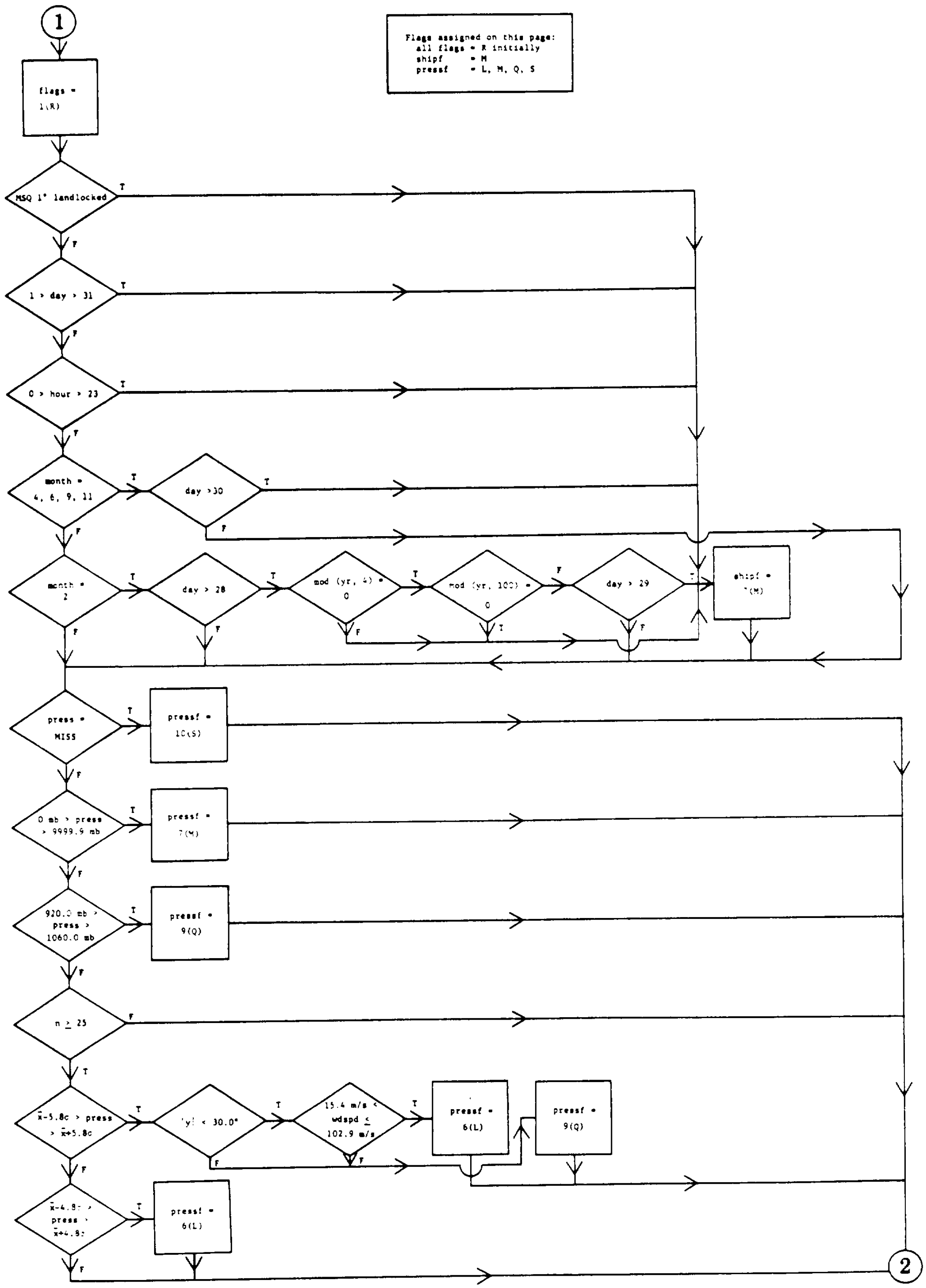
1) A rectangle denotes flag assignment in the form ”flag = n(a), ” where flag is abbreviated as given in Table J0–1 , n is the coded value, and a is its corresponding character value.

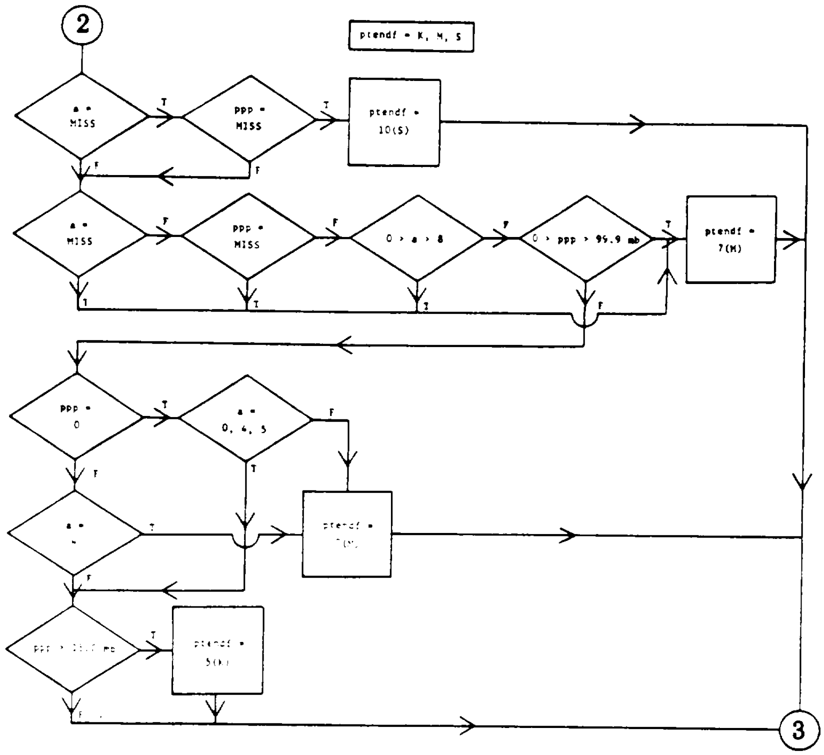
2) A diamond (or in a few cases. a large rectangle) denotes a test involving the element, where the path marked ”T” is followed if the condition stated is true, and the path marked ”F” is followed if the condition stated is false.

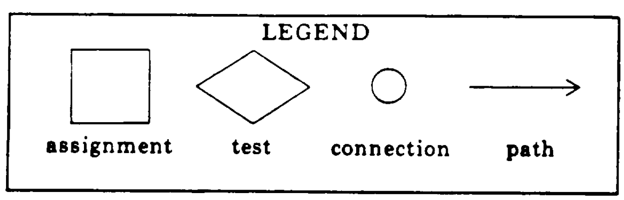
3) A circle denotes flow connections, which connect together the different pages. The flowchart starts at the connection labelled ”1” and ends at the connection labelled ”end” (on the second to last page).

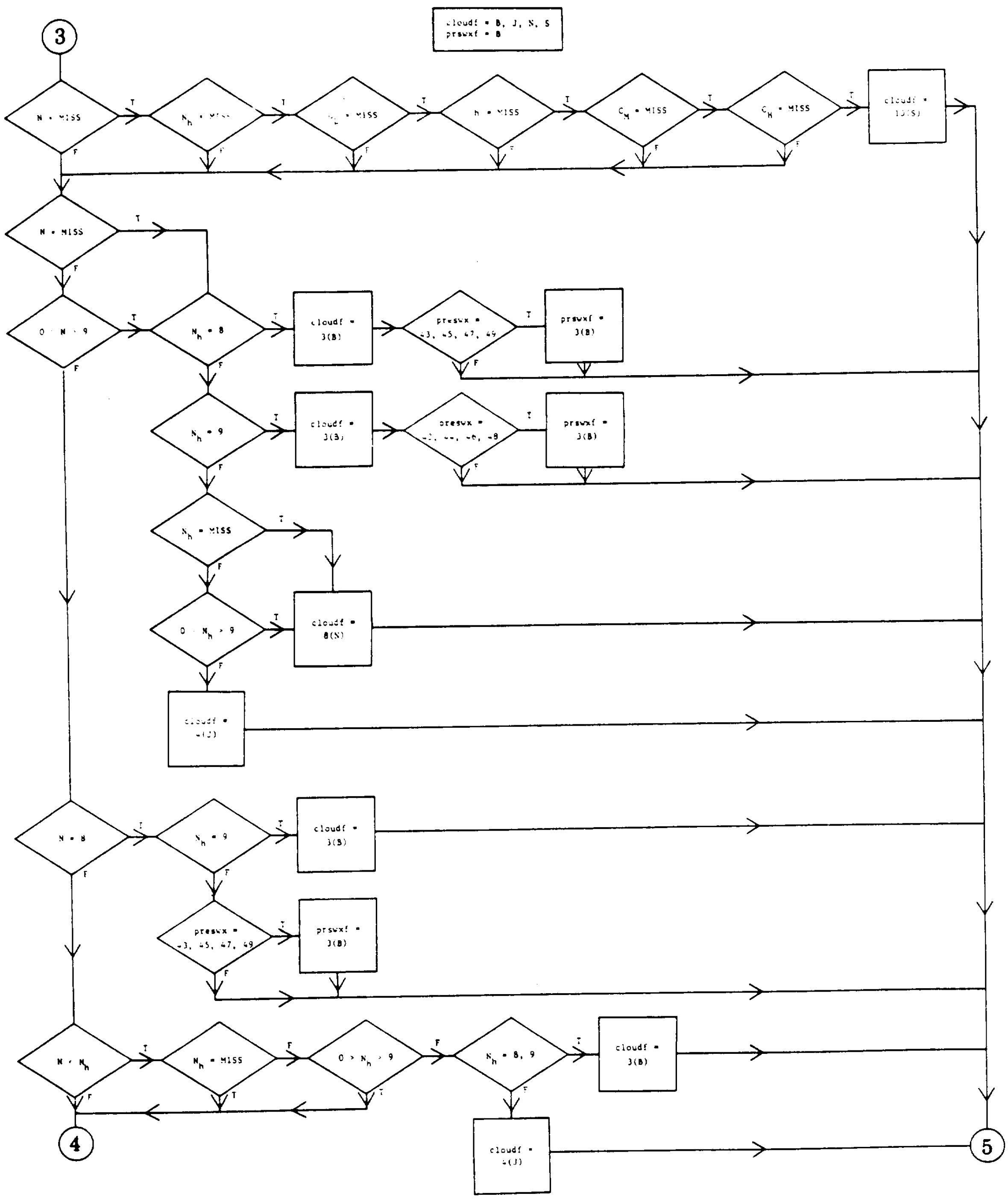
4) Lines with arrows show the path of logical flow (a half-circle on a line bridges the intersection with another line).

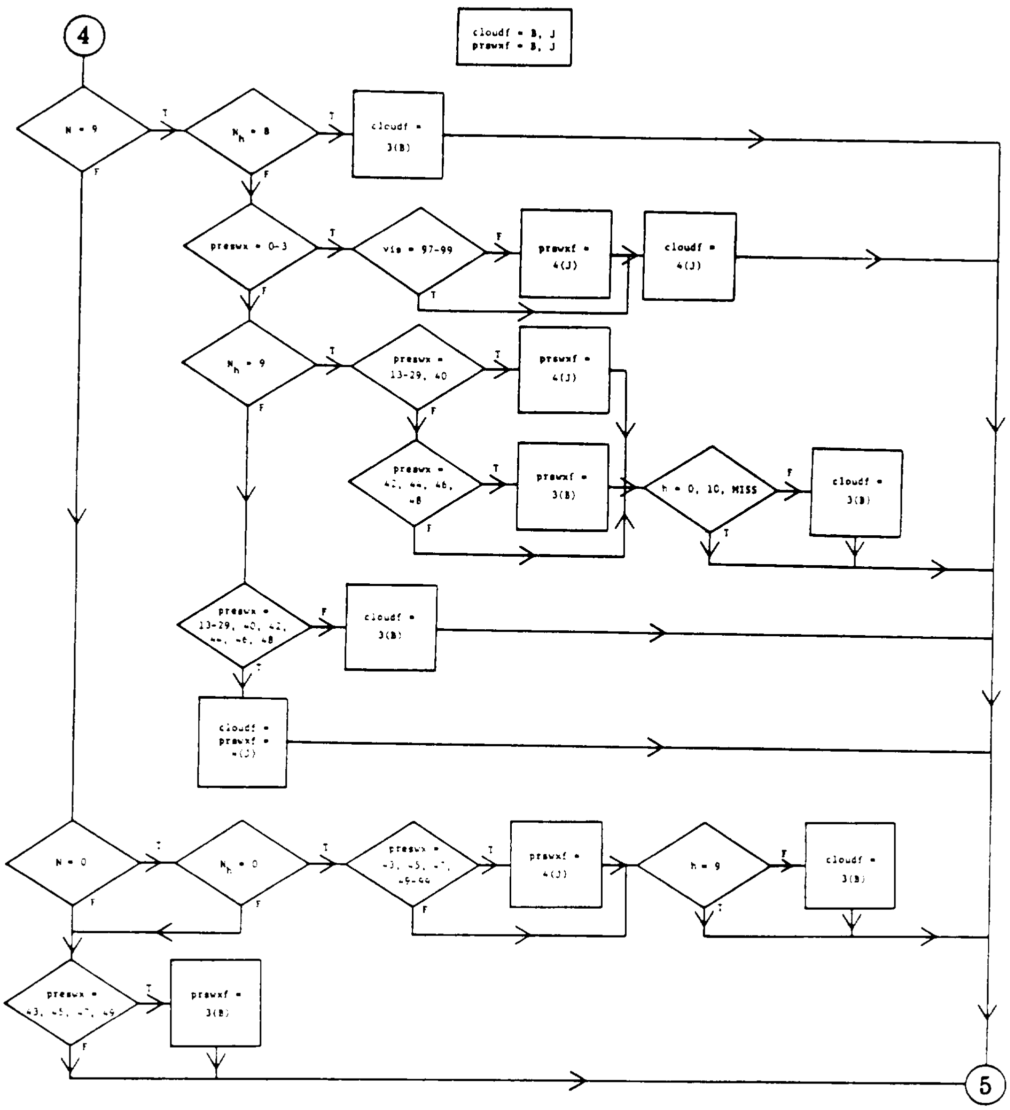
In addition, the various flag assignments covered by a particular page are given at the top of that page.

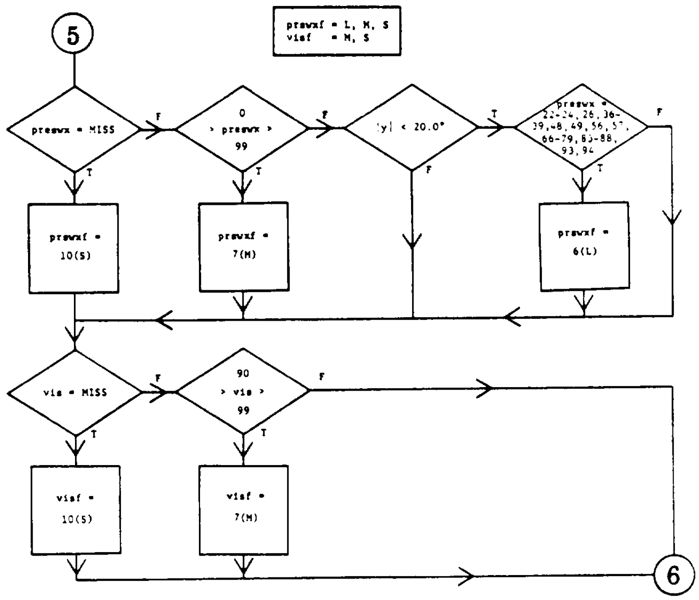

1
flags = 1(R)
Flags assigned on this page:
all flags = R initially
shipf = M
pressf = L, M, Q, S
MSQ 1° landlocked
1 > day > 31
0 > hour > 23
month = 4, 6, 9, 11
day >30
month = 2
day > 28
mod (yr, 4) = 0
mod (yr, 100) = 0
day > 29
shipf = 7(M)
press = MISS
pressf = 10(S)
0 mb > press > 9999.9 mb
pressf = 7(M)
920.0 mb > press > 1060.0 mb
pressf = 9(Q)
n ≥ 25
x̄-5.8c > press > x̄+5.8c
|y| < 30.0°
15.4 m/s < wdspd ≤ 102.9 m/s
pressf = 6(L)
pressf = 9(Q)
x̄-4.8c > press > x̄+4.8c
pressf = 6(L)
2

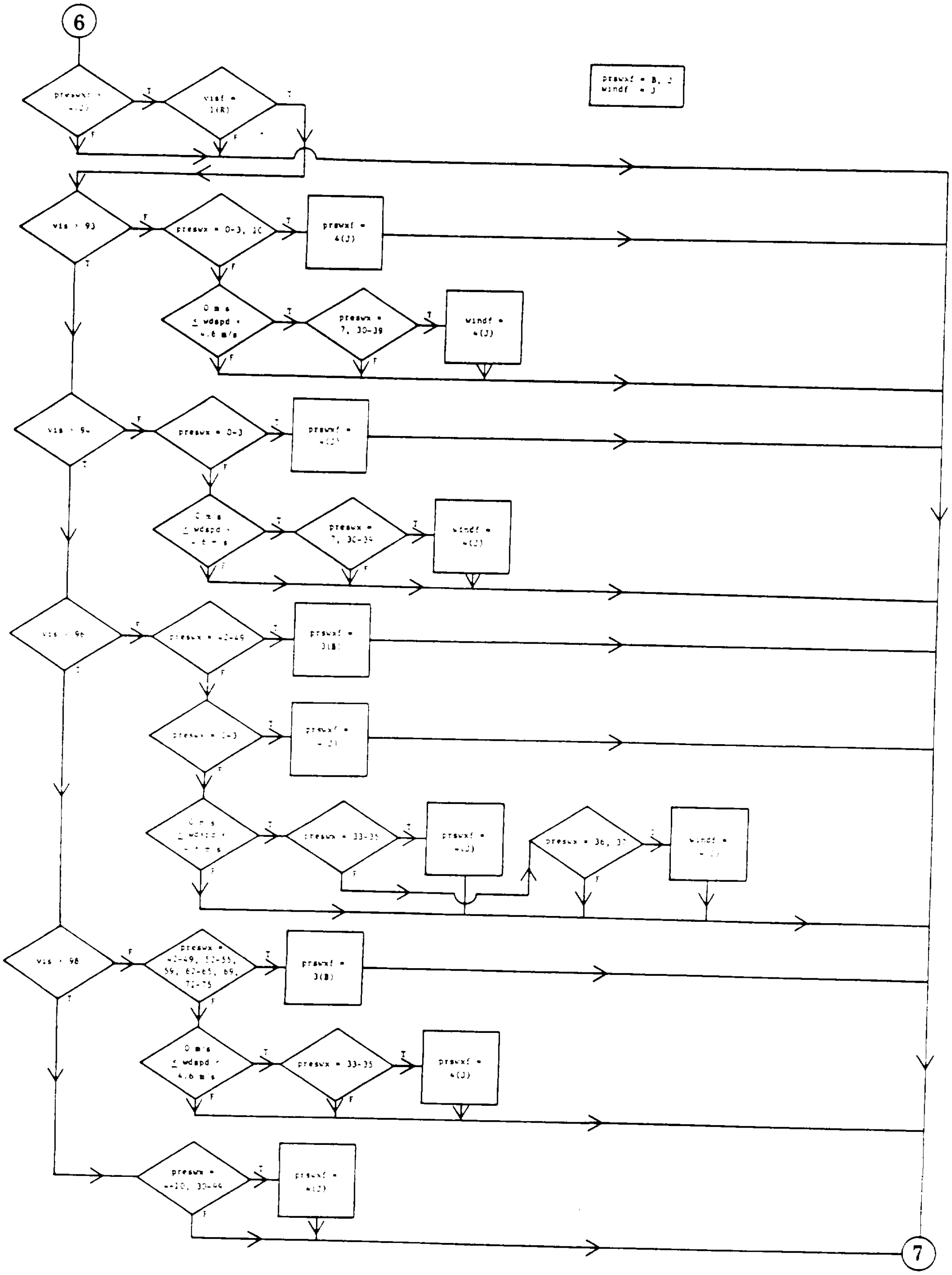

2
ptendf = K, M, S
a =
MISS
T
ppp =
MISS
T
ptendf =
10(S)
F
F
a =
MISS
F
ppp =
MISS
F
0 > a > 8
F
0 > ppp > 99.9 mb
T
ptendf =
7(M)
T
T
T
F
ppp =
0
T
a =
0, 4, 5
F
T
F
T
T
3

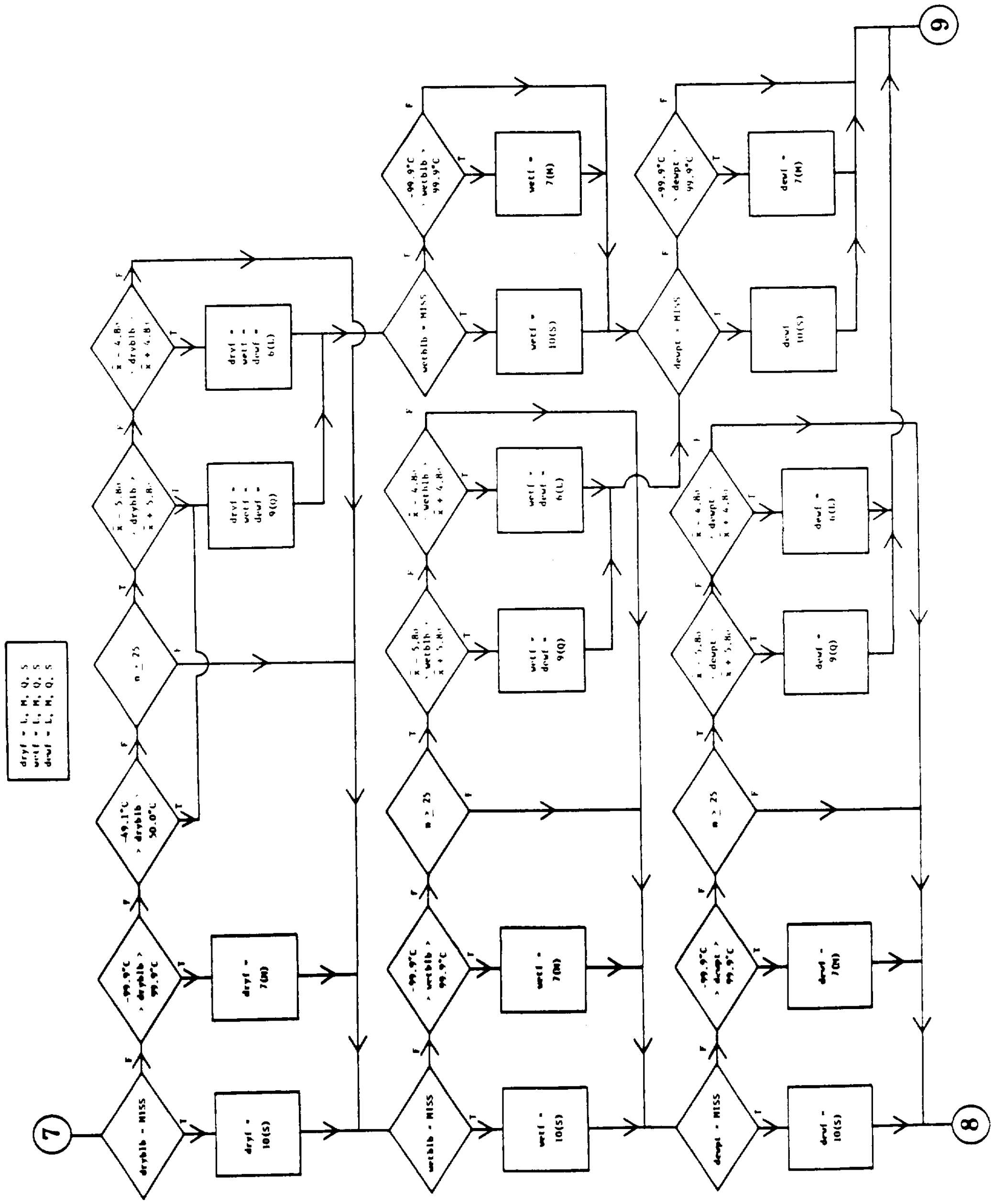

LEGEND
assignment
test
connection
path

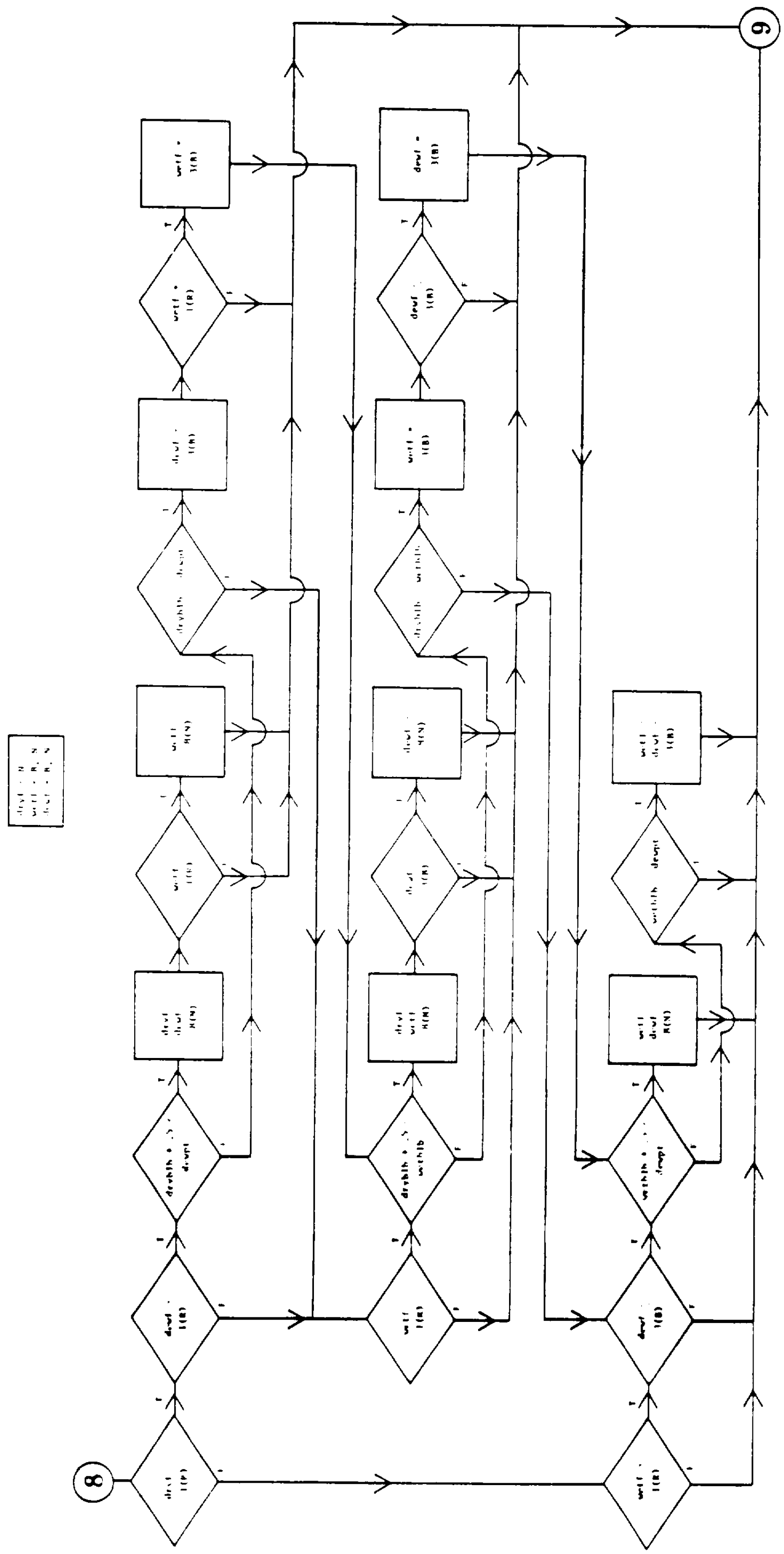

cloudf = B, J, N, S
prswxf = B
3
N = MISS
N = MISS
N_h = 8
cloudf = 3(B)
prswxf = 3(B)
N_h = 9
cloudf = 3(B)
prswxf = 3(B)
N_h = MISS
cloudf = 8(N)
N = 8
N_h = 9
cloudf = 3(B)
prswxf = 3(B)
N_h = MISS
N_h = 8, 9
cloudf = 3(B)
cloudf = 4(J)
4
5

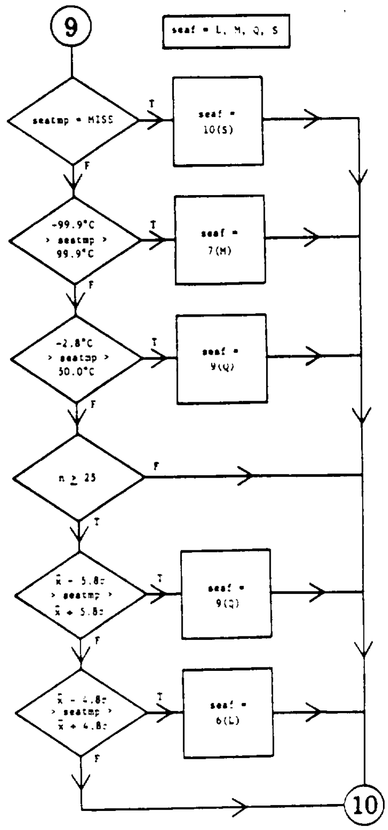

4
cloudf = B, J
prswxf = B, J
N = 9
N_h = 8
cloudf = 3(B)
preswx = 0-3
vis = 97-99
prswxf = 4(J)
cloudf = 4(J)
N_h = 9
preswx = 13-29, 40
prswxf = 4(J)
preswx = 42, 44, 46, 48
prswxf = 3(B)
h = 0, 10, MISS
cloudf = 3(B)
preswx = 13-29, 40, 42, 44, 46, 48
cloudf = 3(B)
cloudf = prswxf = 4(J)
N = 0
N_h = 0
preswx =
prswxf = 4(J)
h = 9
cloudf = 3(B)
preswx = 43, 45, 47, 49
prswxf = 3(B)
5
T
F

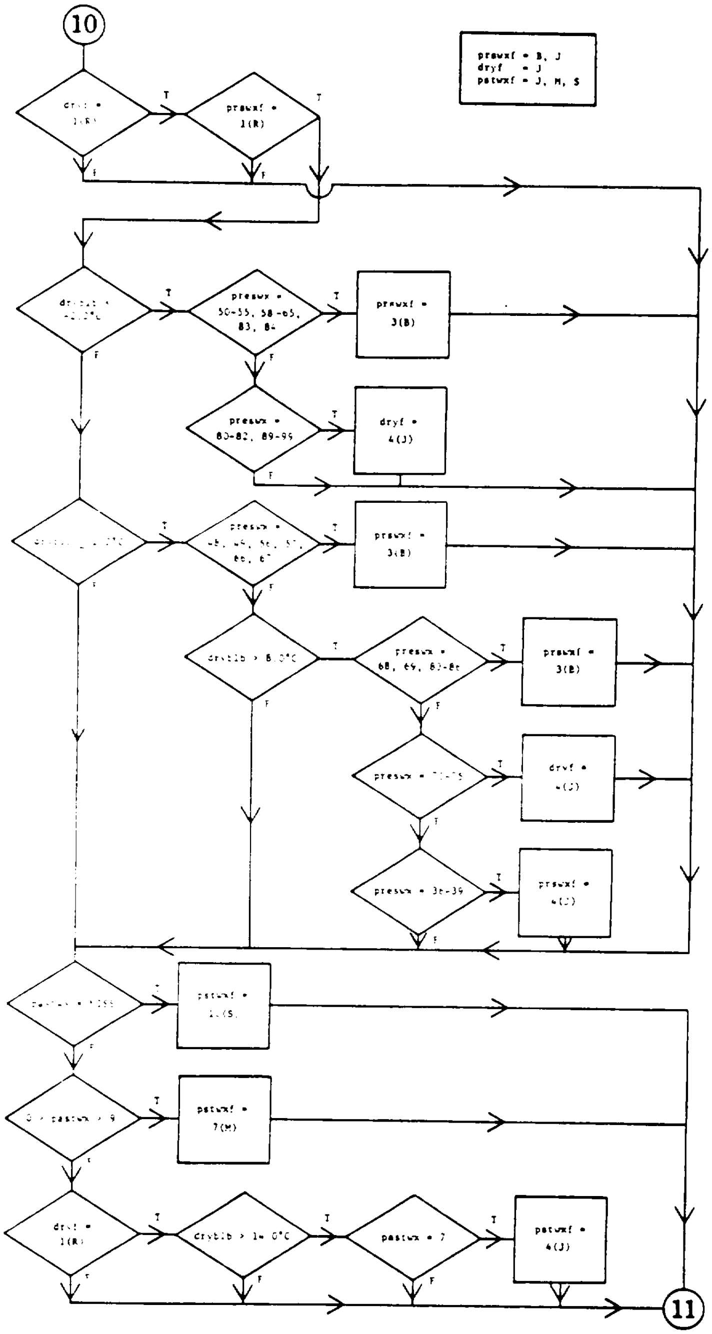

5
prswxf = L, M, S
visf = M, S
preswx = MISS
F
T
0
> preswx >
99
F
T
|y| < 20.0°
T
F
preswx =
22-24, 26, 36-
39, 48, 49, 56,
66-79,
93, 94
F
T
prswxf =
10(S)
prswxf =
7(M)
prswxf =
6(L)
vis = MISS
F
T
90
> vis >
99
F
T
visf =
10(S)
visf =
7(M)
6

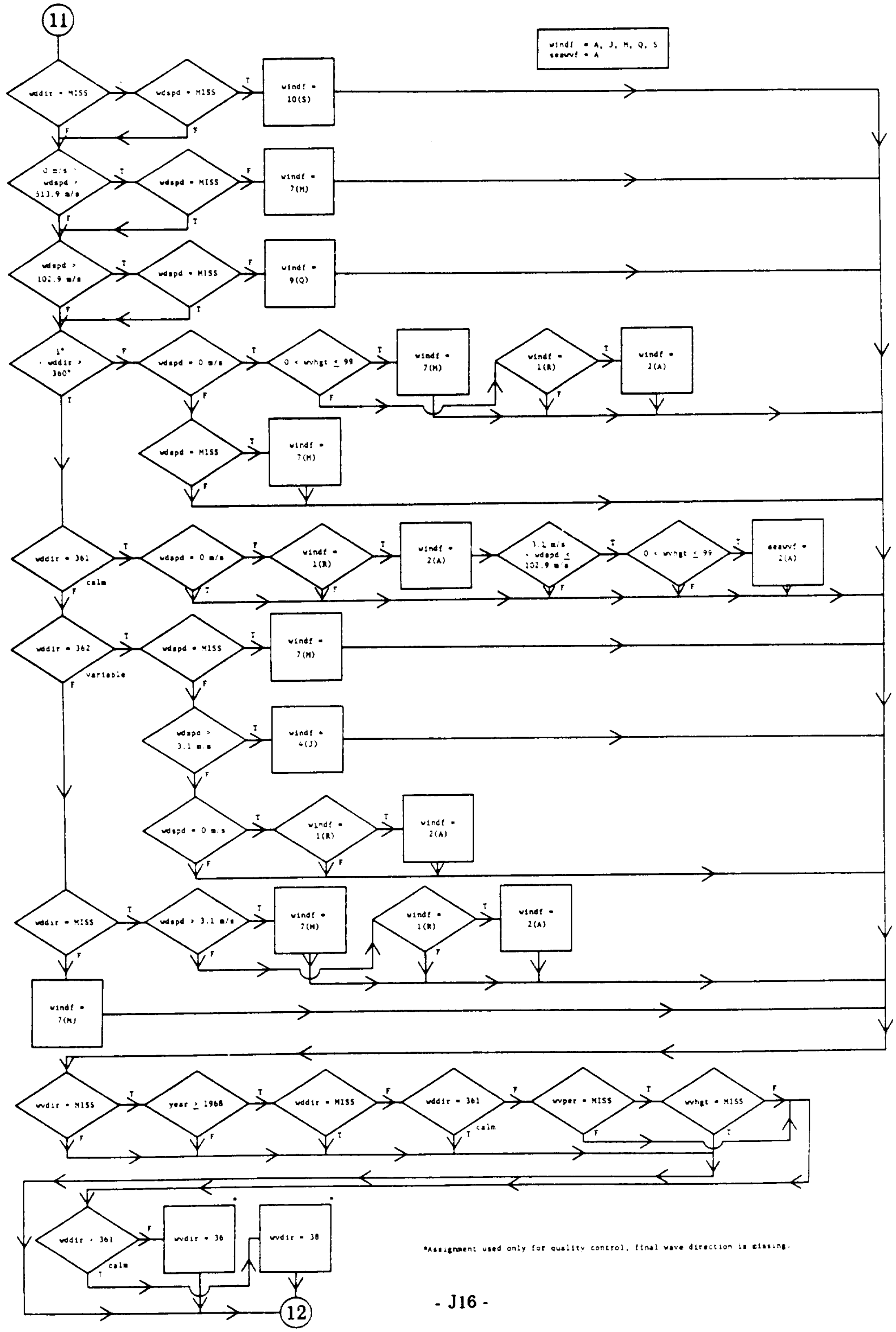

6
vis > 93
prswxf =
4(J)
windf =
4(J)
prswxf =
3(B)
presws = 33-35
prswxf =
4(J)
7



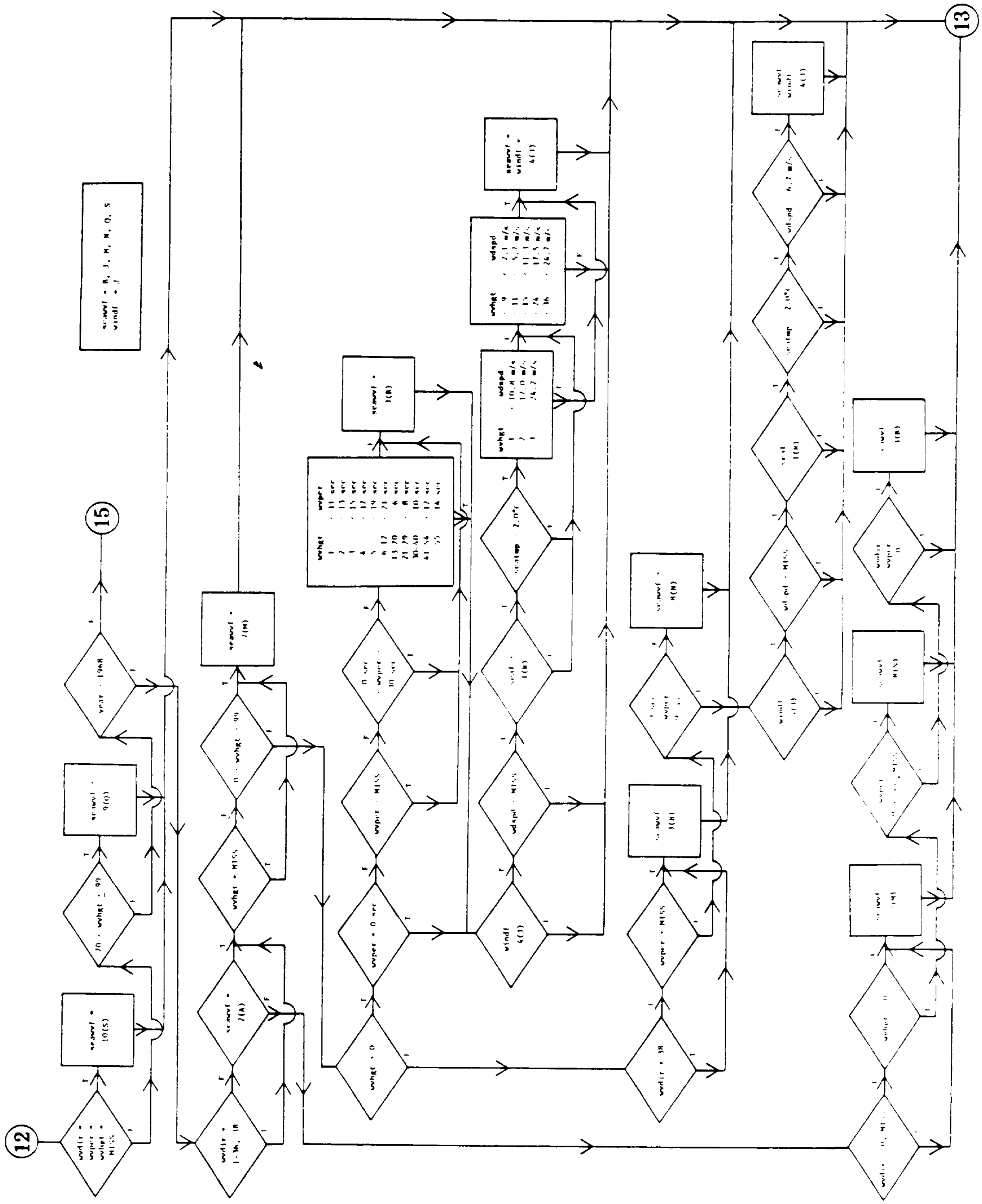


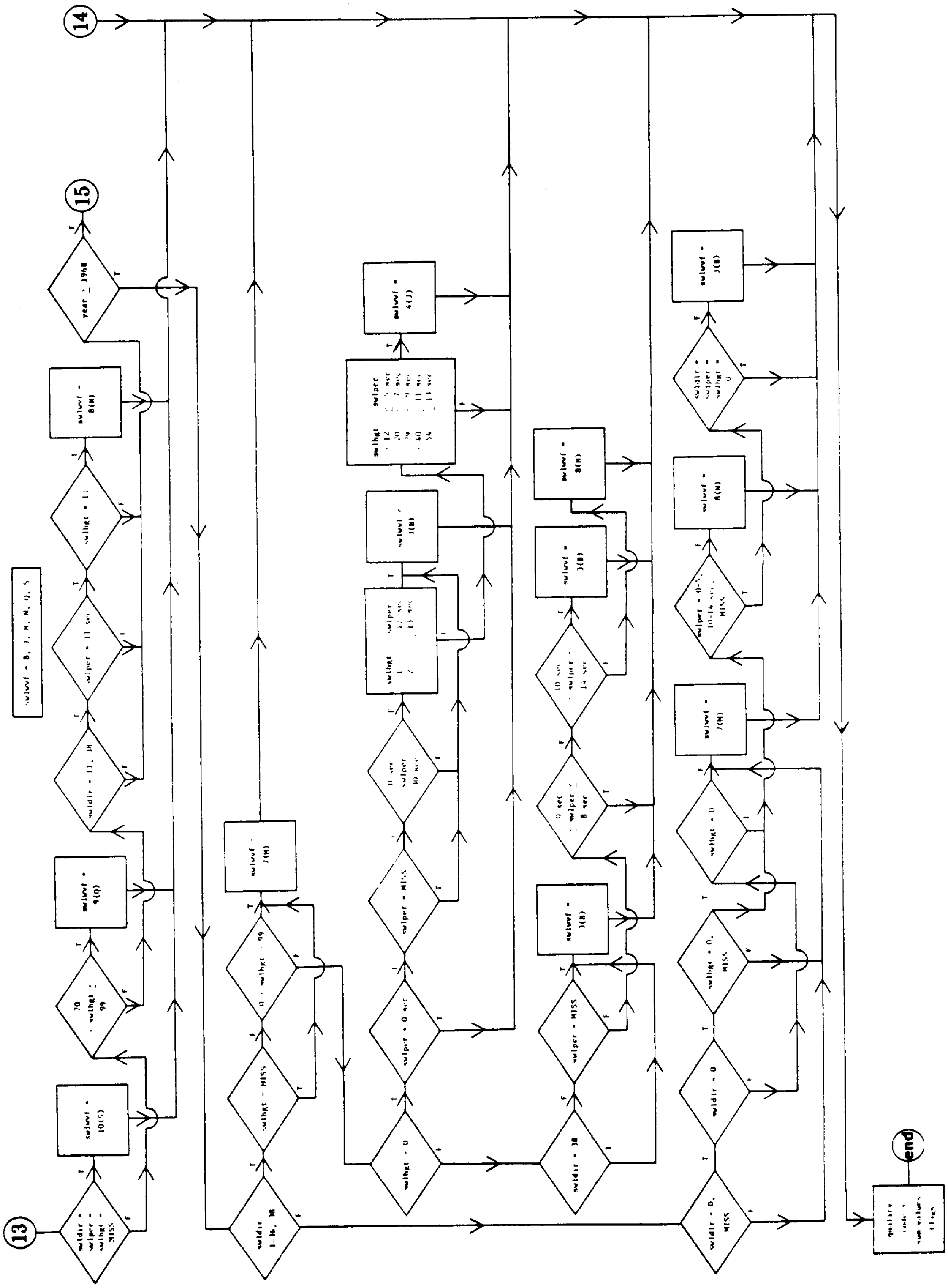

9
seaf = L, M, Q, S
seatmp = MISS
T
seaf = 10(S)
F
-99.9°C > seatmp > 99.9°C
T
seaf = 7(M)
F
-2.8°C > seatmp > 30.0°C
T
seaf = 9(Q)
F
n ≥ 25
F
T
x̄ - 5.8σ > seatmp > x̄ + 5.8σ
T
seaf = 9(Q)
F
x̄ - 4.8σ > seatmp > x̄ + 4.8σ
T
seaf = 6(L)
F
10

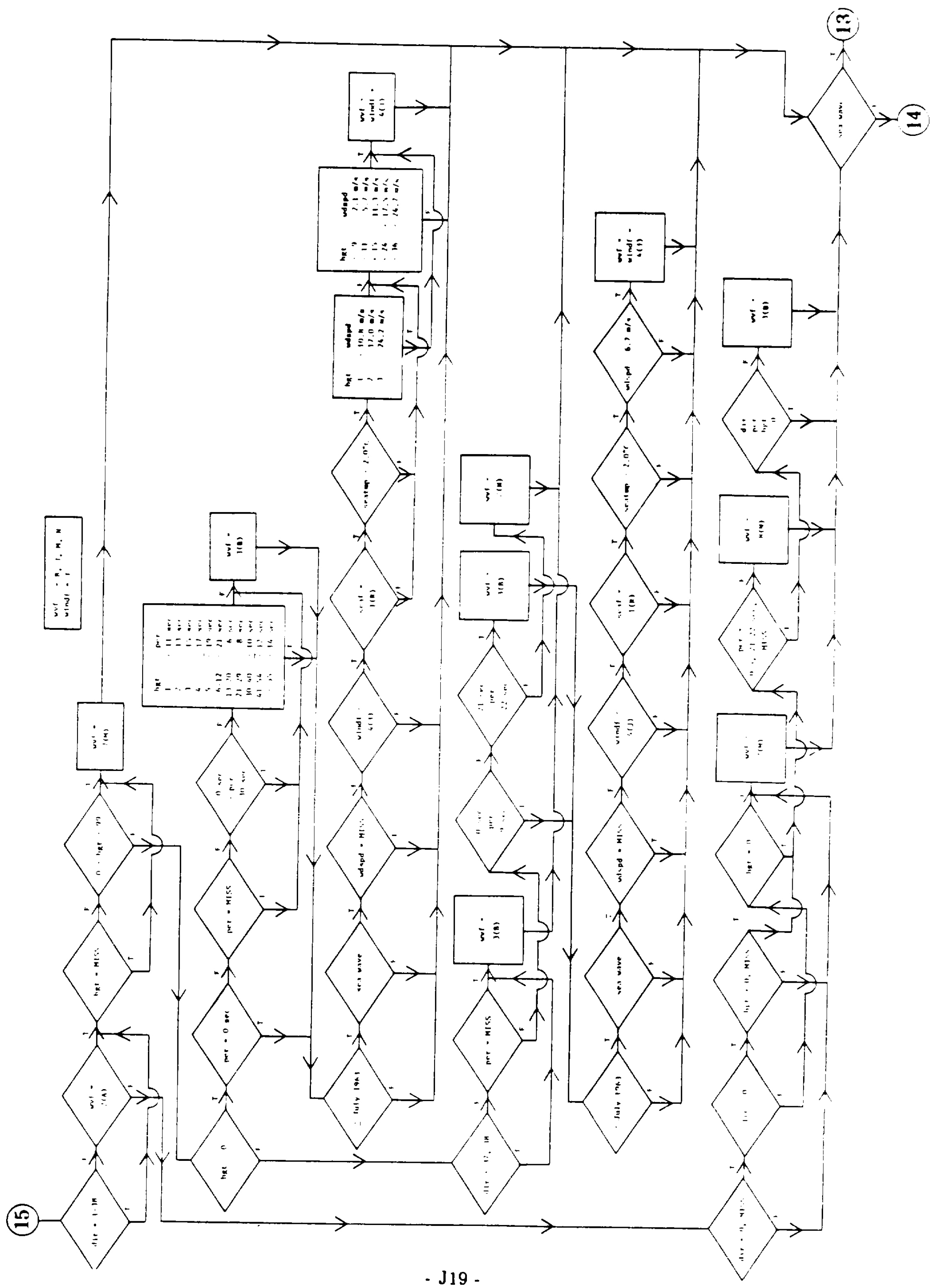

10
prswxf = B, J
dryf = J
pstwxf = J, M, S
T
F
prswxf =
1(R)
T
F
preswx =
50-55, 58-65,
83, 84
prswxf =
3(B)
preswx =
80-82, 89-99
dryf =
4(J)
prswxf =
3(B)
preswx =
68, 69, 83-86
prswxf =
3(B)
presw
prswxf =
4(J)
pstwxf =
7(M)
pastwx = 7
pstwxf =
4(J)
11



*Assignment used only for quality control, final wave direction is missing.


12
13
15


14
15
13
end



Comprehensive Ocean Atmosphere Data Set; Release 1
Supplement K: Duplicate Elimination Procedures
Formats: INV.1, INV.2, INV.3

0. Introduction

Merging several different marine data sets into one file would ideally be a very simple task. Duplicate reports could easily be identified by exact comparison of location, time, and weather fields. Unfortunately, slightly different conversion techniques and interpretations have made duplicates more difficult to locate. In many cases, reports that were once exactly the same now have random Or systematic differences in one or more of their fields. To effectively eliminate all duplicates, the data problems that develop from differing or erroneous processes must be identified be flexible computer checks.

Four main checks can be performed between two reports to identify duplicates (dups): 1) the report's location, 2) date, 3) time, and 4) the individual weather parameters observed. A stringent duplicate elimination (dupelim) plan would require all four checks to show an exact match, for two marine reports to be considered dups. However, if errors or differences do exist in some marine data sets, reports that were actually dups could be considered unique.

The dupelim procedures developed for this project were designed to allow less stringent computer checks on the location, date, time, and weather parameters. These tests were based upon known data base errors, the history of each data set, and anticipation of errors that could occur. Initially dupelim was divided into two categories: "hard" and "easy" procedures. Easy dups are those reports that match exactly in date, time, and location. Hard dups have some type of problem in location or time fields, caused by different conversion techniques, erroneous procedures. etc.

After consideration of the historical background of each data set (sec. 1). both hard and easy dupelim computer programs were prepared and run on selected data sets. Hard procedure were run individually to check on the Atlas against most of the other TD-11 data sets. These procedures and the test results are described in sec. 2 . Easy procedures were run on nearly all TD-11 data sets (except the Atlas) merged into one file. These procedures and the test results are described in sec. 3 . Through this extensive testing. it was decided to combine hard and easy dupelim plans into one. This was done to simplify and streamline the final production program. The resulting dupelim specifications are described in sec. 4 , later refinements are described in sec. 5 . Sec. 6 describes changes made in the final procedures for data during 1970–1979. The production FORTRAN program used is described in sec. 7 .

1. Data Set Histories

In the 1940s and 1950s the United States acquired several foreign sets of keypunched historical ship reports. The card decks were received from a variety of sources and by a variety of methods. For example, the German deck 192 was captured by the Allies during World War 11. Decks 193 and 194 were sent to the United States by the Dutch and British, respectively. Reports in these historical decks ranged as far back as the 1850s and were a valuable addition to a growing marine data base. Unfortunately, data sets were keypunched in entirely different formats. It was therefore impossible to merge the card decks into one file and sort the resulting data base.

In the 1960s it was decided to convert all these independent card decks into one format. This was the beginning of Tape Deck–11 (TD–11) and turned out to be a tremendous programming effort, almost exclusively in COBOL. By the late 1960s, more than 15 independent card decks were at NCDC, totalling about 40 million reports. Each deck had certain unique characteristics and observing methods. To further complicate matters, observing practices changed at specific (or sometimes unknown) time periods for some decks. This resulted in very complicated computer programs, and some hidden errors crept into the original data base.

The WMO–sponsored Historical Sea Surface Temperature (HSST) Data Project was begun in the early 1970s and continued into the 1980s. Marine data were processed independently for the Pacific (United States), Atlantic (Federal Republic of Germany), and Indian (Netherlands) Oceans. Some of the HSST data were unique and not in the original TD–11 data base. However, many HSST data had already been acquired by NCDC in the 1940s and 1950s. Differences were found between the HSST data and the dups in the TD–11 data base. Reports that were once exactly the same now had differences in one or more of the fields that made up the report.

The Navy Marine Atlas Project was started by NCDC in the early 1970s as a special project. This project merged all readily available marine reports into one file, called the Atlas. In addition, this project also attempted to "clean–up" specific inconsistencies found in marine data. Weather, location, and time fields in certain card decks were changed to help rectify errors and biases created during the original conversion to TD–11. Unfortunately, these changes made dups more difficult to locate when the same data were again received from another source.

Towards the end of 1981, a second revision of the '70s Decade data set was completed by NCDC, which follows the Atlas with comparable coverage of the period from 1970 through 1979. Some obvious error corrections were performed, but data that failed quality control procedures were generally flagged instead of changed.

After the completion of these projects, several other data sets became available that make the historical ocean–atmosphere record more complete. COADS is a blend of all these data, after quality control and dupelim.

The history of each marine data set played a major role in the development of dupelim procedures. Therefore, a brief historical description is given for each data set included (see Table 1–1 in COADS Release 1). Many of the problems found by dupelim testing can be better understood by knowing the origin and processing details of the data sets involved.

1.1 Atlas

The Atlas file was created in the 1970s as part of the Navy Marine Atlas Project. This project merged all readily available surface marine reports into one file from which later analysis was used to produce a set of marine atlases, such as [11]. The largest source of data was the original TD–11 data set created in the late 1960s. Other data came from certain supplemental TD–11 files. The HSST data set was not included except for a large area in the South Pacific (10° N to 60° S; 70° W to 160° W).

The Atlas project also attempted to ”clean–up” inconsistencies found in marine data. Internal consistency checks were made for each report during the quality control (QC) process. Occasionally, weather parameters were changed to describe the observed weather conditions better. For example, present weather was changed in specific decks in order to conform to the observed visibility. Dups became more difficult to locate because of these changes.

Because of a 1981 merge of all then–available 1970s data into the ’70s Decade, the Atlas was truncated at 1969.

1.2 Australian

CIRES acquired this data set from the Australians in 1981. The reports cover the period from the 1930s through the late 1970s and were received in ”Ship Logs Data Archive Format.” A computer program was written at NCDC as part of this project, to convert the Australian format to TD–11. Deck 900 was assigned to this data set.

Most of the individual fields were directly transferred from the Australian format to TD–11. However, Marsden Square (MSQ), 1° MSQ, and dew point temperature were computed. Quadrant was changed from the WMO standard to NCDC standard. In addition, the wind speed indicator and sea surface temperature observation method indicator were changed to conform to TD–11. A "9" in either of these fields meant the indicator was unknown.

A few problems were found in the wave data fields. A frequency distribution program was written to determine if the Australians had correctly converted the wave data Fields after WMO changed reporting practices in January 1968. This revealed an error in Australian data processing causing all wind wave periods before 1968 to be incorrectly converted to seconds. Instead of using the pre–1968 WMO code they used the 1968 code. All wind wave periods before 1968 were therefore corrected using the WMO standard.

A few other minor changes were made in the wave period fields in order to conform to then–current WMO practices. All wind wave periods (1968 and after) were put in whole seconds in addition to the coded values. All second swell periods for 1968 and later (coded b), the Australians) were changed to whole seconds and moved into TD–11. The scheme for this conversion is given in Table K1–1 .

Table K1–1
Second Swell Period Conversion

Code (Australian)	Seconds (TD–11)
5	5 and less
6	6
7	7
8	8
9	9
0	10
2	12
3	13
4	14 and greater

A modified frequency distribution program was again run on the Australian data after conversion to TD–11. This was done to determine if the wave period conversions were successful. The results of this last test indicated reasonable wave distributions that conformed to the WMO reporting practices of the time.

1.3 Buoy Data

This file is a collection of reports from automatic observing buoys operated mainly by NOAA during the '70s, except for some buoys that were part of special scientific projects.

Different deck numbers were used to classify buoys by size, shape, or instrumentation. Buoy data now received by NCDC from NDBC (NOAA Data Buoy Center) are no longer separated into different decks, although an individual buoy number, indicative of location and other information, is usually available. The quality of the data is generally higher than that of ship data J81, although these data may have been subject to processing errors in the past.

1.4 Ship Eltanin

The ship Eltanin was operated by the National Science Foundation in the Antarctic region from 1962 to 1973. It was given to the Argentine Navy in 1974. The Argentines operated the ship through 1979 and renamed it Islas Orcadas. The ship is now laid up in Norfolk, Virginia.

Surface synoptic reports (four per day) were taken aboard Eltanin for the entire time period. It seemed likely that these reports were sent to NCDC and incorporated into TD–11 and hence into the Atlas data base. To check this assumption, Atlas data from 28 MSQs were selected from the area south of 30° S in the vicinity of South America and Australia. This area contained 2,333 reports, a significant portion of the Eltanin data set. The reports were visually compared against [2], published source of Eltanin's cruises covering the period April 1962 through October 1968. From this comparison the following was discovered: 1) the Eltanin was assigned ship number "0027" in TD–11, 2) all reports between April 1962 and June 1963 were assigned to deck 116, 3) all reports between August 1963 and October 1968 were assigned to deck 128. 4) some Eltanin reports (about 100) between June 1962 and June 1963 were found missing in the Atlas, and 5) it is unknown whether Eltanin ship reports are in the Atlas after 1968 because 2 went through only 1968.

Since items 4) and 5) indicate apparently missing data, it was decided to locate the original Eltanin ship logs and re–keypunch the missing periods. Unfortunately, these synoptic reports could not be found in NCDC archives. Since this was a special ship, the original records have apparently been stored in a special collection. Therefore, the missing Eltanin reports for the period June 1962 to June 1963 were re–keypunched from [2]. This resulted in the loss of sea surface temperature and wave parameters since these fields were not published. The status of the data after 1968 remains unknown at this time.

While synoptic records were being sought. a set of oceanographic reports from Eltanin was found in NCDC archives, composed primarily of just sea temperature. Apparently synoptic and oceanographic reports were independently, made aboard this vessel. Between the synoptic and oceanographic reports made at the same time, there were usually minor differences in latitude, longitude, and sea surface temperature. These

XBT or MBT oceanographic reports are explained more fully under the NODC history (sec. 1.11). However, it does appear that XBT or MBT Eltanin reports are in the Atlas under deck 891.

1.5 HSST

In the early 1970s, the Historical Sea Surface Temperature (HSST) Data Project was begun. Surface marine data were collected and processed independently for the Pacific (United States), the Atlantic (Federal Republic of Germany), and the Indian Ocean (Netherlands). Renewed interest in historical ship data resulted in backpunching of some older data that were not in NCDC's data base. Many HSST data, however, had already been acquired by NCDC in the 1940s and 1950s and were therefore duplicate with the TD–11 file.

Once all marine reports were collected, the data were exchanged between countries in a compacted Exchange format (described by supp. I), which contained only selected elements. Unfortunately this format did not have a field for data source. This lack of source identification created a problem because many differences in processing were found between the United States sets acquired in the 1940s and 1950s, and the duplicate HSST data processed by the various countries. Therefore, the erroneous processes could not be identified unless a dup in the Atlas matched the HSST report. These differences made documentation and dupelim very difficult for the HSST data set.

1.6 IMMPC (International Maritime Meteorological Punch Card)

IMMPC data are received by NCDC on a continuing basis from several different countries designated by WMO as data collectors. Each collector is responsible for collecting marine data from a specific geographic area and then exchanging these data with the other collectors. All data are exchanged in an INWPC format specified by WMO and include contemporary and, when available, historical marine reports.

In June 1982, several errors were found in the computer program that converted IMMPC data to TD–11. These errors forced all data processed since January 1982 to be reprocessed using a corrected version of this program. The TD–11 data set was resent to CIRES in December 1982 under deck 926, after corrections.

1.7 Japanese

This data set was acquired from M.I.T. during 1975 and sent to NCDC by CIRES for conversion. Observations were taken by the Japanese whaling fleet and other Japanese ships, primarily in the polar region of the Southern Hemisphere. All reports were sent in an IMMPC format that required conversion to TD–11 by NCDC. Several errors were found in the conversion program after the data had been processed and sent to CIRES. These errors forced all data to be reconverted using a corrected version of the program. A corrected magnetic tape was sent to CIRES in December 1982 under deck 926. Since this deck number was the same as another IMMPC data set, CIRES changed the deck number of all reports to 898.

Three internal problems were found in some reports that required preprocessing. Two of the three problems involved illegal overpunches in the longitude and temperature fields. The third problem involved some dew point temperatures (about 3%) erroneously sent in degrees Fahrenheit. To ensure that a double conversion to degrees Celsius would not occur, the following procedure Was used to identify dew point temperatures in degrees Fahrenheit.

If dew point was greater than dry bulb (air temperature), the report was written to a separate file for visual inspection. From this inspection, it was determined that all dew points should be converted to Celsius if the difference between the dew point and the dry bulb was greater than or equal to 10° . For example, if the dew point was 31.8° and the dry bulb was 1.1° , the dew point was converted to Celsius because the difference was greater than the arbitrary 10° tolerance.

1.8 MSQ 486 Pre-1940

Data from a portion of MSQ 486 were lost at some stage of processing when the Atlas was created. The error was found by comparing inventories of the original marine data base and the subsequent Atlas file. This revealed that many reports were missing before 1940 from MSQ 486. The error probably came about in the selection process. Pre-1940 data for MSQ 486 from the original marine data base were sent to CIRES for inclusion. Dupelim tests were not performed on this file.

1.9 MSQ 105 Post-1928

A similar problem in the Atlas involved the omission of roughly 100,000 reports, which was discovered only in 1983 after COADS dupelim and untrimmed processing was complete.

Therefore, no dupelim tests were performed on this file, but MSQ 105 was run or re-run through all but the untrimmed processing steps.

1.10 Monterey Telecommunication

Monterey Telecommunication reports cover the period October 1966 through 1977. They were acquired by NCDC from NOAA/NMFS (National Marine Fisheries Service) in Monterey, California. In transmittal this data set was named "Kunia" ship reports and was sent in a packed binary format. The original tapes reside in NCDC tape library under TD-9769.

Serious problems prevented this data set from being incorporated into the Atlas during the late 1970s. These problems appeared to be confined to the pre-'70s data. Therefore, deck 555 was included in the '70s Decade but excluded from the Atlas.

For the pre-'70s, it was decided to pre-process the Monterey data set to eliminate erroneous reports and most "hard" dups by using three conditional checks shown in supp. I . Table K1-2 summarizes tests performed upon several Marsden Squares using these three conditional checks in order to eliminate erroneous reports. Of all the Monterey reports eliminated, most had "-0013000" in columns 70-77 (wave period and height; swell period and height).

Table K 1-2
Monterey Pre-Processing Test Results

MSQ	Total reports	Total number of reports eliminated	Reports eliminated based upon positions 70-77
30	2,765	1,061	1,010
300	969	278	266
310	965	367	361
356	473	95	89

1.11 NODC Surface, and Supplement

These data were acquired by NCDC from the National Oceanographic Data Center around 1978, and consist of reports from three different types of vessels. XBT (Expendable Bathythermograph) and MBT (Mechanical Bathythermograph) reports contain only temperature measurements (primarily sea temperature). The SD (Station Data) reports are usually more complete meteorological reports, taken aboard oceanographic survey ships. The data acquired in 1978 contained all historical reports available at the time. Recent data have been received by NCDC from NODC on an annual basis.

1.12 Ocean Station Vessels, and Supplement

Ocean Station Vessels (OSV) were ships that reported weather conditions at more or less fixed positions at sea. A ship was considered "on station" when it was on duty within about a 210-nautical-mile square centered at its assigned position. Otherwise it was considered "off station." NCDC archives OSV data for "on station" only and "on and off station" combined. Combined data were included in this project. The individual stations are A, B, C, D, E, H, I, J, K, M, N, P, and V. Additional stations Q, S, T, U, and X were included in the Supplement.

1.13 Ocean Station Vessel Z

Ocean Station Vessel Z was acquired from South Africa by NCDC. The OSV was operated by, South Africa off the Cape of Good Hope and was unofficially named "Z" by NCDC. Data cover the period 1971–1974.

1.14 Old TDF–11 Supplements B and C

These supplemental TD–11 files contain data collected by NCDC after the original marine data base was created (c. 1968), consisting of historical and then–current marine reports. The exact history of these two files is rather obscure, but it is known that data from some supplemental files were merged and a new supplemental file started as part of an occasional update. Available supplemental files ,A,ere included in the Atlas when the Atlas tapes were created.

1.15 South African Whaling

In 1967, NCAR acquired from South Africa more than 100,000 punched cards in an unknown format for the region south of 50° S. Many cards had been destroyed by rodents in South Africa. The cards from the original 1967 receipt now reside at NCAR.

This data set was especially troublesome because the format was not known. Several inquiries by NCAR to South Africa did not resolve the format question. In October 1982 it was decided to try and decipher as much of the format as possible.

CIRES sent a converted tape in November 1982 to NCDC, changing all illegal overpunches and characters to blanks. NCDC tried to decipher the format on the basis of experience gained with other historical formats, and succeeded in deciphering about 40%. Through CIRES testing of the output. another 20% of the format was deciphered. including the important discovery that columns 44–45 contained an indicator for supplemental data fields in columns 46–80.

Since most of the format was now known. it was decided to convert all data to TD–11 and perform dupelim tests with other data sets. When dups were found, the South African report was checked against the matching report to determine if fields were correctly assigned. From the dups that were found. the South African format was completely deciphered except for some of the supplemental data fields.

The computer program that converted South African Whaling data to TD–11 was written at NCDC. All fields before column 44 were transferred to TD–11. Columns 44–45 and columns 46–80 were an indicator and supplemental data fields, respectively. These fields were moved as one long character string into TD–11. This was done because time would not permit the extensive programming required for a field–by–field transfer and because many of the supplemental data fields would not fit in TD–11.

In order to fit into TD–11, several fields had to be computed or converted. MSQ and 1° MSQ were computed, and octant was converted to quadrant. Air, sea surface, and dew point temperatures were converted from whole degrees Fahrenheit to tenths of a degree Celsius. Wet bulb temperature was computed when air and dew point temperatures were both present. Since the leading digit(s) of the pressure field was truncated, the following procedure was used: 1) if pressure was less than or equal to 599, then 10,000 was added to the field; 2) if pressure was greater than 599, then 9,000 was added to the field.

Several problems found in the hour field forced many reports to be deleted entirely. These problems involved different time–reporting practices, resulting in hour values outside the range 00 through 23. Fortunately, the reporting procedures were associated with an indicator in columns 44–45. The indicator also matched specific decks in the Atlas. The correct hour in GNIT could therefore be deciphered by, performing dupelim tests (see Table K1–3).

Table K 1–3
South African Hour Problem

Indicator (columns 44–45)	Matching Atlas deck	Hour problem
1	188	many hours equal 99
11	192	hour between 50 and 73
3	194	field blank
33	194	field blank
00–23	unknown	field blank

Hours between 50 and 73 turned out to be in local time plus 50 as opposed to GMT. All hours coded as 99 were missing values. Blank hour fields were usually associated with deck 194, which reported by watch number. However, occasionally hour was reported in the indicator field (columns 44–45) while the hour field was blank. This occurred only when columns 46–80 were blank. To transfer as many hours as possible to TD–11, the following procedures were used, in order: 1) if hour was 00–23, it was transferred directly to TD–11; 2) if hour was 50–73 and indicator equal to 11, the report was deleted; 3) if hour was 99, it was transferred directly; 4) if hour was blank and indicator equal to 3 or 33, the report was deleted; 5) if hour and indicator were both blank, hour was changed to 99 and transferred; 6) if hour was blank and indicator not blank and supplemental data field not blank. hour was changed to 99 and transferred; 7) if hour was blank and indicator not blank and supplemental data field was blank, hour was changed to the indicator and transferred; or 8) if hour was not numeric, it was changed to 99 and transferred.

Procedures 2) and 4) deleted 35.187 reports from the South African data set. Results of dupelim testing indicated that these reports were already in the Atlas file. Therefore, this large number of deletions had little if any effect on the final data base.

1.16 ’70s Decade

Similar to the COADS project, the NCDC ’70s Decade (1970–19’49) project brought together several marine data files, uniformly edited and merged into a single file. The resulting data base (TD–1127, later converted at CIRES to TD–1129) was of higher quality and provided more economical service to surface marine data users. Additional information on this data base is available in 161.

1.17 709 Decade Mislocated Data

During conversion of the ’70s Decade from TD–1127 to TD–1129, performed at CIRES, reports with erroneous or inconsistent time/space location fields were discarded to a separate file. However, conversion from TD–1129 to LMR permitted the Marsden Square number to be inconsistent with latitude, longitude, and quadrant under certain circumstances (supp. I) and qualifying reports were accepted.

2. Hard Duplicate Elimination Test Procedures

Hard dupelim procedures were run individually on nearly every TD–11 data set against the Atlas. For example, tests were performed on Atlas versus HSST, Atlas versus IMMPC, etc. Initially, the following checks were made to determine dups: 1) location was tested to whole degrees latitude and longitude. instead of tenths of a degree; 2) date was checked to be within 1 day; 3) hour was allowed to vary by 1; and 4) seven individual weather elements were checked for equality. These elements were wind speed, visibility, present weather, past weather, sea level pressure, air temperature, and sea surface temperature. For reports to be considered dups, three parameters could be unequal if seven common elements were present. Two parameters could be unequal if five or six common elements were present. One parameter could be unequal if three or four common elements were present. There could be no parameters unequal if only one or two common elements were present.

If any of conditions 1) through 4) were not met, the two reports were considered unique with respect to each other. When all the conditions were met, the two reports were considered dups and written to a separate file. To ensure that dupelim was finding ”good” dups, a checksum program was then run on the dup output file. This program made counts of exact matches and those that had some type of data problem (matches inexact). Unique data problems found by the check–dup program were then written to a separate file for visual inspection. From this visual inspection, the final dupelim plan was fine–tuned to handle the data problems effectively.

Several additional dupelim programs were also developed for finding other unique data problems missed by this procedure. These programs involved varying the stringency, of the four main checks just described. One program had a less stringent check on location. Another program had no check on hour, whereas another allowed year, month, day, and hour to vary by one. In addition, the number of unequal weather elements allowed for duplication was varied. These additional dupelim programs found several data problems missed by the main plan.

Sample results of hard dupelim testing (Table K2–1a) compare the HSST data set with the Atlas file, in terms of the overall percentage of HSST reports that matched the Atlas, and the percentage of those matching HSST reports with some type of data problem. MSQS* and time periods were carefully chosen to provide a representative sample of each TD–11 data set. Tables K2–1b and K2–1c show these results separately for different Atlas decks. Similar tables were constructed for other TD–11 data sets discussed in secs. 2.1 through 2.18 .

* All dupelim testing at NCDC and its initial specifications used Marsden Squares, but the final implementation (see secs. 5–7) actually used the ”105 box” system (supp. G).

2.1 Result of Dupelim Testing: Atlas vs. Atlas

When the Atlas was created in the 1970s, an error was found in the computer program that identified dups. This error happened only when dups and non–dups all had the same location and time fields. Under these conditions when dups were interspersed with non–dups, some reports that were actually dups found their into the final Atlas data base. Because this error affected only the North Atlantic basin. it was decided to perform extensive dupelim tests on that portion of the Atlas file. Other ocean basins besides the North Atlantic were also tested to determine the effectiveness of the dupelim plan that created the Atlas.

A modified hard dupelim program was run on the Atlas file. All Atlas reports from a test square were kept in the same file and compared with each other. Fourteen MSQs were tested, totalling 173,858 reports. Of this total only 710 (or 0.4 percent) were dups. A few interesting differences were found between the dupelim plan developed for this project and that used for the Atlas.

The main difference is that the current dupelim procedures test latitude and longitude only to whole degrees, whereas old procedures tested to tenths of a degree. When this less stringent check on location is used, Atlas deck 188 seems to be a complete duplication of deck 192. The old procedures failed to discover this because deck 188 had location originally keyed to tenths of a degree, while deck 192 was keyed only to whole degrees. A similar discrepancy was found between matches of decks 194 and 197.

Table K2–1a
Overall Results from Hard Dupelim Testing: HSST vs. Atlas

#	Area	MSQ	Period	Report Count		Percentage of HSST matches[a]	Percent-age inexact[b]
				Atlas	HSST		
1	Pacific	132, 429	–1879	10,022	8,424	86.9	22.1
2		121,124,429	1880–1909	13,339	16,440	75.9	14.8
3		25,46,129,197,429,121	1910–1939	59,610	30,309	64.8	10.3
4		22,84,90	1940–1960	39,470	4,761	64.6	0.5
5		all above	–1960	121,441	59,934	70.9	13.0
6	Atlantic	148,339,479	–1879	47,100	30,886	98.8	5.9
7		114,300,410	1880–1909	33,012	96,537	32.0	36.4
8		5,76,217,449,520	1910–1939	65,755	70,214	75.0	35.4
9		38,220,406	1940–1960	54,579	139,547	36.2	18.8
10		all above	–1960	200,446	337,184	48.8	25.0
11	Indian	363,474	–1879	34,682	23,663	97.6	81.8
12		30,397,441	1980–1909	60,777	79,012	72.9	39.7
13		179,367,436,470,513	1910–1939	63,887	67,638	81.4	61.3
14		27,440,543	1940–1960	42,947	45,148	54.1	20.7
15		all above	–1960	202,293	215,461	74.3	50.3

[a] Percentage of HSST reports. out of the total count, that matched the Atlas.
[b] Percentage of HSST reports, out of the number matching the Atlas, that had at least one type of data problem causing them not to match exactly.

Table K2–1b
Individual Deck Results (Part 1)
for Hard Dupelim Testing: HSST vs. Atlas

	Deck 116		Deck 118		Deck 184		Deck 189	
#[a]	%M[b]	%I[b]	%M	%I	%M	%I	%M	%I
1								
2								
3							0.1	18.2
4	2.3						19.2	
5	0.2						1.6	0.6
6								
7								
8			0.9					
9	0.03	0.0[c]	0.07		7.7	0.0c	1.2	68.9
10	0.01	0.0[c]	0.2		3.2	0.01	0.5	68.9
11								
12								
13	0.09		2.6					
14	0.3		10.0		5.0		23.6	46.8
15	0.09		2.9		1.1		5.0	46.6

[a] Numbers identify areas and time periods as labelled in Table K2–1a .

[b] Percentage of HSST matches (%M) or percentage inexact (%I) as given in Table K2–1a , but for the indicated decks, only.

[c] A very small number, as opposed to blank meaning exactly 0.

Table K2–1c
Individual Deck Results (Part 11)
for Hard Dupelim Testing: HSST vs. Atlas

	Deck 192		Deck 193		Deck 194		Other decks	
#	%M	%I	%M	%I	%M	%I[a]	%M	%I
1	14.1	3.7			72.8	25.7		
2	23.3	6.7			52.7	38.3		
3	36.2	5.2			28.4	36.9		
4					43.1	0.8		
5	26.7	5.4			42.5	18.2		
6	6.7	42.6b	91.6	3.1	0.6	15.6		
7	23.2	45.0b	4.6	1.0	4.2	28.2		
8	44.6	46.6b	21.9	20.5	7.5	16.1	0.05	2.6
9					15.1	0.6	12.1	48.6
10	16.6	45.8b	14.3	9.5	9.1	7.0	5.0	49.5
11	3.0	31.5b	84.6	9C.0	9.9	27.0		
12	20.9	35.9b	51.5	41.5	0.6	15.9		
13	24.4	32.3	41.7	95.8	12.5	16.6		
14					15.2	0.8	0.01.	90.0
15	15.6	34.1b	41.2	69.6	8.4	11.9	0.005	90.0

[a] The percentage does not reflect data problems associated with location coordinates (tenths of degree latitude and longitude)

[b] More than one data problem in each report.

Another minor problem occurred when reports matched deck 116. Air and / or sea surface temperatures between the two dups differed occasionally by a few tenths of a degree. This problem occurred with almost every data set that has reports that match deck 116. There were also some wind speed differences between obvious dups. Both of these problems required special treatment in the final dupelim plan.

The extent of dups in the North Atlantic basin turned out to be insignificant. Of the four MSQs tested (114. 148, 217. and 220), only 11 dups were found. The programming error in the dupelim plan that created the Atlas apparently. had little effect on the resulting data base.

2.2 Results of Dupelim Testing: Australian vs. Atlas

A total of 21,659 reports from six MSQs was selected from the Australian data set (about 10%) and compared against the Atlas. Dups were found only during 1960-1969. In every case the duplicate Australian report matched deck 128 in the Atlas.

Two data problems were found. The first problem involved several dups that were exact matches except for days off by 1. These reports were obvious dups since all weather elements (six out of six) matched exactly. The second problem involved present weather equal only to the tens digit. For example, the Atlas report would have present weather coded 51 while the Australian report would have 53. This type of difference. caused by the Atlas quality control. occurred 59 times in the test run and required special treatment.

2.3 Results of Dupelim Testing: HSST vs. Atlas Deck 116

Unexpected duplication was found between HSST data and deck 116. A small number of dups were found in several MSQs in all three ocean basins (see Table K2-1b). It was not possible to identify the HSST data source in the Atlantic and Indian basins. However, in the Pacific where data source was available, deck 116 matched HSST decks 150 (Dutch) and 152 (English).

The HSST-deck 116 dups in the Atlantic are explained in 5 . For some reason, OSV reports (about 15,000) for stations "India" and "Julliette" (which were a part of original deck 194) were reproduced years ago and placed in deck 116. This means that some reports in deck 116 are not Merchant Marine but OSV and originated from deck 194.

The reason for the HSST deck 116 matches in the Indian and Pacific basins is more speculative. Apparently, many years ago, the United States exchanged data with the Dutch and English. They seem to have lost track of the source and sent it back to us as HSST data. This presents no problem to this project since dupelim is largely independent of data source. However, it could mean that HSST sea surface temperatures are not strictly bucket observations (deck 116 contains intake temperatures) as was previously assumed during the HSST project.

A data problem also exists in Atlas deck 116 and probably HSST data. All air and sea surface temperatures were supposed to be coded in Fahrenheit, although a few ships coded one or both of these parameters in Celsius. In conversion of deck 116 to TD-11, all temperatures were changed from Fahrenheit to Celsius. resulting in a double conversion for some observations. Temperatures being converted from Celsius to Celsius were eliminated in Atlas deck 116 only when they fell outside acceptable quality control limits for a given area. Since there is no way of identifying which reports have this problem, the same approach was taken for the HSST data set.

2.4 Results of Dupelim Testing: HSST vs. Atlas Deck 118

Exact dups were found between deck 118 and HSST data in both the Atlantic and Indian basins. However, no matches were found in the Pacific (see Table K2-1b). No data problems were discovered that required special procedures. However, it was found that both air and sea surface temperatures were reported only to whole degrees Celsius. This is verified in [5].

2.5 Results of Dupelim Testing: HSST vs. Atlas Deck 184

In the Atlantic and Indian basins, HSST-deck 184 matches were found in all six MSQs tested for the 1940-1960 period (Table K2-1b). No matches were found in the Pacific basin.

A Beaufort wind problem was found in the Atlantic basin. A small percentage of reports in the HSST file had wind speeds converted directly to knots from meters per second, as opposed to being bracketed at the arbitrary midpoint for the Beaufort wind force. To correct this error within the dupelim plan. the affected HSST wind speeds were reconverted from the original values in meters per second that were saved in the supplemental data fields.

2.6 Results of Dupelim Testing: HSST vs. Atlas Deck 189

All three ocean basins had HSST-deck 189 matches. In the Indian basin, these dups represented the largest percentage of total matches for the 1940-1960 period (Table K2-1b).

Two data problems were found. In the Pacific and Indian Ocean basins, a very small number of HSST reports had exact dups with deck 189 when the day was off by 1. This could be similar to the problem in Atlas deck 194 (sec. 2.9) since hour was converted from watch number for some reports. The source of this error (deck 189 or HSST) could not be determined since the original records were not available at NCDC.

The second data problem involved the Beaufort wind scale and required special dupelim procedures. In the Atlas, wind speeds in deck 189 required no conversion since they were recorded directly in knots. However, the HSST format required all wind speeds to be in meters per second. These HSST wind speeds should have been reconverted directly back to knots when they were put in TD-11 format. Instead, they were bracketed at the midpoint for the appropriate Beaufort wind force. This problem affects about half of the HSST-deck 189 matches and

was found only in the Atlantic and Indian basins. Special allowances were made in the dupelim plan to reconvert HSST wind speeds directly to knots when a report matched deck 189 in date, time, and location.

2.7 Results of Dupelim Testing: HSST vs. Atlas Deck 192

HSST-deck 192 matches were found in all three ocean basins, and represented the largest source of dups in the Atlantic and second largest in both the Pacific and Indian Oceans. Several data problems exist, affecting 5.4% of the total matches in the Pacific, more than 45.8% in the Atlantic, and more than 34.1% in the Indian Ocean (Table K2-1c). Exact percentages could not be calculated easily for the Atlantic and Indian basins because more than one data problem was often found in a single report.

Two errors occurred in all three ocean basins. Sea level pressure in the HSST file was found to be consistently off by a tenth of a millibar or recorded to whole millibars when a report matched Atlas deck 192. To eliminate all dups. sea level pressure was tested only to whole millibars for deck 192.

The second problem involves hour. In conversion from local time to GMT, slightly different time zones were used for the HSST file and Atlas deck 192. This resulted in the hours differing by 1 in longitude bands near the 24 time zones across the world. This problem was eliminated in the Pacific basin in a past project by comparing HSST deck 151 (HSST data source identifiable in Pacific) with deck 192. When time was within 1 hour, the reports were considered dups and deck 192 was retained over the HSST.

In the Indian and Atlantic basins, where this error was not previously corrected, a large number of HSST-deck 192 dups were found to have the hour problem. In addition, when the hour crossed into the next day. dups were found that had days off by 1 and hours at 00 or 23 GMT.

It follows that on the last hour of an arbitrary month and/or year, dups may occur in which the Nears are off by 1. months are off by 1 or 11, days are off by 30, 29, 28, or 27. and hours are either 00 or 23 GMT. No attempt was made in the current dupelim plan to find dups when hour crossed into the next month and or year. Therefore, some HSST reports that are actually dups were considered unique. Their number is expected to be extremely small and should have little effect on the final data base.

In addition to the errors described in all ocean basins. a major Beaufort wind scale problem was found in the Atlantic basin. All estimated HSST wind speeds were supposedly sent to NCDC in meters per second according to the "new" Beaufort scale. Conversion programs at NCDC assumed this and changed wind speeds to knots by bracketing at the midpoint of the "new" Beaufort scale. However, the Germans appear to have erroneously sent the wind speeds according to the "old" Beaufort scale. Therefore, some wind speeds (at midpoints 2, 5, 13, 44, 52, and 60 knots) in the HSST file were assigned the wrong speed and never match Atlas deck 192. This affects 40% – 50% of the HSST–deck 192 dups. To correct this conversion error, special allowances were made in the dupelim plan to reconvert HSST wind speeds using the "old" Beaufort scale when reports matched deck 192 in date, time, and location.

2.8 Results of Dupelim Testing: HSST vs. Atlas Deck 193

Dups between deck 193 and HSST data occurred in both the Atlantic and Indian basins. However, no matches were found in the Pacific because Dutch data were received only for the years after 1938 (Table K2–1c). Several major data errors were found.

Hour was frequently off by 1 when HSST–deck 193 dups were found. This error is probably similar to that described in sec. 2.7 for Atlas deck 192. Apparently, slightly different time zones were used when converting from local time to GMT. The same pitfalls described for deck 192 apply to HSST–deck 193 dups.

The second error concerns location coordinates. In the original reports, location was recorded only to the nearest 1° MSQ. When the report was converted to TD–11, tenths of degree latitude and longitude were arbitrarily placed at the corner of the 1 MSQ in the Atlas rile (location coordinates were given a tenths digit of 0); whereas the HSST location was assigned a tenths digit of 4 in the Atlantic, and a tenths digit of 5 in the Indian. Since dupelim procedures are based upon whole degrees, no modification of the plan was required.

The third error involved sea level pressure. This parameter was rarely found in the Atlas data set but was almost always available in a matching HSST report. Reference manuals indicate that sea level pressure was corrected for temperature and reduced to mean sea level but was never corrected for gravity. For this reason sea level pressure was excluded from the Atlas file for deck 193. HSST reports with sea level pressure were probably also never corrected for gravity, but were keypunched anyway.

The fourth error is much more serious and required special dupelim procedures. Air or sea surface temperatures in the HSST file were occasionally found to have the tens, units., or tenths digits truncated to 0 or blank. For example, if sea surface temperature in a deck 193 Atlas report were 28.5°C, the corresponding value in the duplicate HSST report could be 28.5, 8.5, 20.5, or 28.0. This air or sea surface temperature error was found in about 1% of the HSST deck 193 dups and was never found to affect more than one digit out of a three-digit temperature field. This presented a major problem for the dupelim plan. Since HSST data source is unidentifiable in the Atlantic and Indian basins, a bad HSST temperature is found only when the report matches one in the Atlas file. And if both air and sea surface temperatures have this truncation error within the same report, current dupelim procedures would consider the report unique and introduce erroneous temperatures into the final data base.

To eliminate potential HSST dups having this error, each temperature field was tested digit by digit. For example, an HSST report might match a report in Atlas deck 193 in location and time, but not in air and sea surface temperatures:

Example:	Air temperature	Sea surface temperature
Atlas	25.5	22.1
HSST	20.5	2.1

To handle such a situation, each temperature was tested for equality digit by digit between Atlas and HSST reports. If two of the three digits were equal and the third digit in the HSST rile was 0 or blank (as in example), the temperatures were considered an exact match, the reports would be considered dups, and the Atlas number would be kept (see sec. 5.10).

In addition to the data problems just described, two other errors were discovered only in the Indian basin. The first error is very serious and required special dupelim procedures for HSST-deck 193 matches. Exact dups were found when there was a 6- or 7-hour difference between Atlas deck 193 and HSST data. This error was found only in octant eight of the Indian Ocean and, in most cases, affects nearly all of the HSST-deck 193 matches (Table K2-1c). It is assumed that the error source is Dutch-processed HSST since this problem was not found in

German-processed HSST data of octant eight in the Atlantic basin. The original records would have to be checked to confirm this assumption.

The key to the 6- or 7-hour difference could be the fact that the error occurs only in octant eight. Since the world is divided into four octants north of the equator and four south, the time difference is 6 hours between octants. Apparently, a computer program that converted the original reports placed the time in the wrong but neighbouring octant. This would make the hour off by 6. Since the location of the duplicate Atlas and HSST reports is the same, it is assumed the programming error occurred only in time and not location (i.e., the reports are in the right place but have the wrong time). The 7-hour difference is probably a combination of the 6-hour error and the time zone error.

The second problem in this ocean basin involves day but affects only a very small number of reports. Exact dups were found when Atlas deck 193 had day 31, while HSST had day 30. This occurred only when the next month had 30 days (i.e., the error was found only in March, May, August, and October). Apparently, a computer program (probably the Dutch) incorrectly assigned to these months only 30 days. No modification of the dupelim plan was necessarily since it tolerates differences of 1 day.

Several assumptions have been made in order to explain these data problems. To verify these assumptions, additional research is needed, possibly involving some type of track checking as well as going back to the original Dutch records. Whether the HSST or Atlas data sets are at fault is unknown at this time.

2.9 Results of Dupelim Testing: HSST vs. Atlas Deck 194

HSST-deck- 194 matches were found in all three ocean basins. In the Pacific, these matches represented more then 40% of all the HSST reports tested for that basin. The Atlantic and Indian Oceans also had significant percentages (Table K2-1c). Several data errors have been identified.

The first error concerns date. In the early years, ship reports were made according to watch number. much corresponded to a particular hour. On the midnight watch (number six) of an arbitrary day. Atlas deck 194 reported hour 00 local time of the next day. when the hour was converted to GMT. an error placed the report in the wrong (previous) day. The percentage of inexact matches in Table K2-1c indicates that this type of error was rarely found in the later years (1940-1960) but represented 15%-28% of the early year matches (before 1940). Apparently, sometime around 1940. reports in deck- 194 were no longer taken according to watch number but recorded directly in hours.

Dupelim procedures were designed to handle this day crossing problem only within a month. No attempt was made to find HSST dups that crossed into the next month or Near. Testing was done in the Pacific basin to determine the magnitude of this crossing month and year problem. Several areas were tested and revealed only about a 0.4% error. This means that about 0.4% of the HSST reports from this particular data source would be considered unique. when there are actually dups.

The second error concerns location coordinates. This error is identical to that described in sec. 2.8 for Atlas deck 193. In the original reports. location was recorded only to the nearest 1° MSQ.

The third error was found in the Atlantic basin only and involved Beaufort wind speeds. A small number of HSST reports had wind speeds converted from meters per second directly to knots. When matched with Atlas deck 194, it was found that these Atlas wind speeds were bracketed to the appropriate Beaufort midpoint. To correct this error within dupelim. the affected HSST wind speeds were bracketed using the original values in meters per second that were saved in the supplemental data fields.

The final error concerns wind speed. All calm wind speeds are missing in Atlas deck– 194 but are available in the HSST data set. Apparently, the computer program that converted deck 194 to TD–11 interpreted calm wind speeds as missing values. These calm values were inserted into Atlas deck 194 when a match was found with HSST data.

2.10 Results of Dupelim Testing: HSST vs. Other Atlas Decks

Dups with HSST data were found in six other Atlas decks: 128, 188, 196, 197, 891, and 902. Deck 188 matches were found in both the Atlantic and the Indian basins. Otherwise, these decks had HSST dups only in the Atlantic (Table K2–1c).

Beaufort wind scale problems were found between HSST data and Atlas decks 128, 188, 196, and 902. HSST data were converted directly to knots in some cases, indicating that wind speeds were measured. The Atlas decks were bracketed at the appropriate midpoints according to the Beaufort force. HSST data were reconverted within dupelim and then bracketed using wind speed in the supplemental field. This solved the dupelim problem but does not determine whether HSST or Atlas data are in error. In MSQ 220, this error source is significant. Deck 128 matched HSST reports 16,702 times. Of these dups, about 48% had Beaufort wind conversion problems.

Other minor problems were discovered. An hour of 99 was found in several HSST reports that matched Atlas deck 188. indicating a missing value. Another error in hour was uncovered in HSST–deck 891 dups. An hour of 24 was found in the HSST rile when it should have been hour 00 of the next day. This is a fairly common problem for this data source and has also been found in the NODC data set. For consistency, any hour 24 was converted to hour 00 of the next day.

2.11 Results of Dupelim Testing: IMMPC vs. Atlas

Six MSQs were chosen for dupelim testing with the Atlas. IMMPC reports matched only Atlas decks 116 and 128. A few minor data problems were found.

As a result of Atlas QC. present weather was equal only to the tens digit for a few IMMPC reports when matched with deck 128. Also, some deck 116 dups had wind speed differences of a few knots. Occasionally temperatures were slightly different when a report matched Atlas deck 116.

2.12 Results of Dupelim Testing: Japanese vs. Atlas

Several MSQs were chosen for dupelim testing with the Atlas. Dups were found with Atlas decks 119, 128. and 187. A few minor data problems were uncovered in decks 119 and 187.

When Japanese data matched deck 119, air and/or sea temperatures differed occasionally by a few tenths. Atlas deck 119 appears to have temperatures only to whole degrees, while the Japanese data have values to tenths. In addition, for matches with decks 119 and 187, present weather was sometimes equal only to the tens digit. These two minor errors required special allowances.

The last discrepancy involved a few day or hour crossings between dups. This did not require special treatment because it was within the tolerance of the dupelim plan.

2.13 Results of Dupelim Testing: Monterey Telecom. vs. Atlas

Two MSQs were chosen to test for dups. About 200–300 of the Monterey reports were duplicate with the Atlas. However, almost all these dups had one or two minor data problems.

The first problem involved slightly different air and/or sea surface temperatures between dups. In addition, sea level pressures were usually found to be different by a few tenths of millibar. When one or both of these problems occurred, the rest of the report was almost always identical with the Atlas report. Therefore, to eliminate dups, special procedures were required for sea level pressure and temperatures in deck 555.

2.14 Results of Dupelim Testing: NODC vs. Atlas

Ten MSQs were chosen for dupelim testing with the Atlas. Of this total, 4 MSQs had reports that were almost entirely duplicate with the Atlas, and 6 were almost entirely unique. Closer examination of test square locations and NCDC's Atlas inventories revealed that the dups were confined to the South Atlantic and South Pacific. Apparently NODC data had not been merged into any other basin.

A few date problems were found. Hour in deck 891 was occasionally keyed as 24 instead of 00 and the next day. In addition, a few reports in Atlas deck 194, 195, and 891 matched NODC data except for an hour difference of 1.

2.15 Results of Dupelim Testing: OSV vs. Atlas

Two OSV's were chosen for dupelim testing with the Atlas. Station A (MSQ 220) was in the North Atlantic and station P (MSQ 195) was in the North Pacific. The duplicate OSV reports found were primarily. assigned to OSV deck 116 but matched Atlas reports in both decks 116 and 128. Of all OSV reports. 23.2% were duplicate in MSQ 195 and only 0.3% in MSQ 220.

Two data problems were found. Air and/or sea surface temperatures Usually differed by a few tenths when matched with deck 116 in the Atlas or OSV data set. A special check for deck 116 in MSQ 195 indicated that of the total number ef matches (7,231). there were 5,479 dups in which either the Atlas or OSV report was assigned to deck 116. Of this number, 4,404 had air temperature equal only to whole degrees. and 4.040 had sea surface temperature equal only to whole degrees. In addition to the temperature problems, a few dups had days differing by 1.

2.16 Results of Dupelim Testing: Old TDF-11 Supplement B vs. Atlas

All reports in this data set were found to be duplicate when compared against the Atlas. However, several data errors were discovered. Occasionally present weather was equal only to the tens digit (the result of Atlas quality control). This occurred in matches with Atlas deck 189 and 128. Air and sea surface temperature matches were frequently different by a few tenths of a degree when deck 116 was involved. A minor wind speed error was found when deck 116 matched deck 189. Fourteen wind speeds were different by one or two knots in reports that otherwise matched exactly. This could be a Beaufort wind scale discrepancy or a mixup of estimated and measured speeds. In addition, erroneous air and sea surface temperatures were found in deck 118 from the Supplement B data set, such as negative temperatures in equatorial MSQ 27. The corresponding Atlas report had missing temperatures (apparently deleted in the Atlas quality control) when matched with these erroneous Supplement B temperatures.

With the exception of those in deck 118, all errors required special treatment in dupelim. The deck 118 temperature problem was identified in QC when the erroneous temperatures were flagged. The origin of these bad values is unknown at this time.

2.17 Results of Dupelim Testing: Old TDF-11 Supplement C vs. Atlas

Dups were found in only one of the three MSQs tested. A total of 20.9% of the reports tested matched the Atlas. Only 1.8% of these dups had some type of data problem.

The most common problem was equality of present weather only to the tens digit. This occurred in matches with decks 116 and 194 and required a special allowance in the dupelim plan. Temperatures were also different by a few tenths when matched with deck 189, However, the occurrence was too infrequent to require special treatment.

2.18 Results of Dupelim Testing: South African Whaling vs. Atlas

Two MSQs were chosen for dupelim testing with the Atlas. Square 520 represented 1910-1939. Dups were found with Atlas decks 188 and 192. Test square 543 covered 1940-1960. Data for this period matched reports in Atlas decks 116, 184, 187, 189, and 194. It appears that the South African Whaling data set is a collection of many historical sources. However, many reports are unique, especially in the later years.

Several errors were found in this data set. More than 85% of all dups were not exact matches. The most common problem was air and/or sea surface temperatures, differing by a few tenths, which occurred with matches of many Atlas decks. This is easily explained. The temperature fields for the South African data were keyed only to whole degrees Fahrenheit; the tenths position was either truncated or rounded. When these temperatures were changed to tenths of a degree Celsius by the NCDC conversion program, an obvious loss of accuracy resulted. This loss of accuracy from converting whole degrees Fahrenheit to Celsius is a possible explanation for other card decks (116, 119, and 555) that have similar temperature problems.

In addition to the temperature problem, sea level pressure was occasionally equal only to whole millibars for matches with Atlas decks 189 and 192. Also, present weather was equal only to the tens digit for matches with Atlas decks 184, 188 and 194. Some wind speeds in Atlas decks 184 and 192 differed by a few knots when matched with the South African data set.

To eliminate dups in this difficult data set, several special procedures were required for deck 899. These involved temperatures, pressure, present weather, and wind speed, and are explained in sec. 4.

3. Easy Duplicate Elimination Test Procedures

Easy dupelim tests were run on all TD–11 data sets (except the Atlas) merged into one file. These tests were performed to identify dups only among TD–11 sources other than the Atlas. The Atlas was excluded because extensive tests using hard procedures had already been performed between the Atlas and all other TD–11 data sets.

Once all data for a particular test MSQ were merged into one file. the reports were sorted by MSQ. 1° MSQ, year, month, day, hour, and sea level pressure. The easy dupelim program tested only for exact matches with date, time, and location (whole degrees only). When these conditions were met. the two reports were considered dups and written to a separate rile. Otherwise, the reports were considered unique with respect to each other. Weather parameters were not tested in this first stage of easy dupelim.

To find out if this procedure was too lenient, a check–dup program was run on the dup output file. This program was similar to the one described in sec. 2. Counts were made of exact matches and those that had one or more unequal weather elements. When location and time matched exactly between two reports, tests were performed on four weather elements: wind speed, sea level pressure, air temperature, and sea surface temperature.

Table K3–1a gives overall easy dupelim test results. and Table K3–1b has details on which source data sets matched. The most frequent data set match was with the HSST, as was expected because the HSST data set is a conglomeration of many marine files. Also, there were a significant number of dups within some data sets.

Table K3–1a
Overall Results from Easy Dupelim Testing

#	MSQ	Period	Report count	Percentage of matches
1	27	1940–1960	58,760	19.2
2	38	1940–1960	71,464	17.0
3	220	1940–1960	95,324	27.8
4	356	1960–1969	14,686	4.8
5	440	1940–1960	9,296	18.1
6	543	1940–1960	3,146	1.6
7	all above	1940–1969	252,676	20.7

Table K3–1b
Individual Source[a] Results from Easy Dupelim Testing

#[b]	H H[c]	H B	H 1	H 0	H W	H A	I 1	I M
1	0.02	15.9	3.0			0.01		
2	0.05	0.004	16.9				0.01	
3	12.9		0.01	14.9			0.001	
4			2.3				1.5	0.01
5	0.7	2.0	15.4					
6	0.3				0.7			
7	4.9	3.8	6.2	5.6	0.01	0.003	0.09	0.0004

#	I J	I W	B B	B I	B A	O O	M M	W W	
1			0.2	0.02	0.05				
2			0.001	0.004					
3					0.001				
4			0.4				0.6		
5				0.01					
6	0.1	0.2						0.4	
7	0.001	0.002	0.06	0.01	0.01	0.0004		0.03	0.01

[a] Source data sets are abbreviated as follows:

A = Australian

B = Old TDF–11 Supplement B or C

H = HSST

I = IMMPC

J = Japanese

M = Monterey Telecom.

N = NODC

O = OSV

W = South African Whaling

[b] Numbers identify areas and time periods u labeled in Table K3–1a .

[c] Percentage of matches for HSST vs. HSST, etc.

In addition to the easy dupelim plan just described, two other tests were performed to determine if any hard dups were present in the merged file. These tests were exactly the same as the easy dupelim plan, except for using less stringent checks upon two fields. The first program had no check upon 1° MSQ; the other had no check on hour. No hard dups were found through these tests.

4. Pre–'70s Duplicate Elimination Specifications

The dupelim plan developed for this project was designed according to specific data problems described earlier. For simplicity in programming, hard and easy dupelim procedures were combined into one general plan. This was possible because easy dupelim procedures were encompassed by hard procedures.

Five main checks are performed to eliminate dups among all data sets: 1) location, 2) date, 3) time, 4) individual weather parameters, and 5) special deck allowances. Checks 1) through 4) are the same for all data sets. Check 5) is more specific and applies only to certain data sources or decks.

4.1 Conditions Applied to All Data Sets

The conditions listed in Table K4–1 are checked in the stated order to identify possible dups.

Table K4–1
Duplicate Elimination Conditions

Type of check	value in first report	Relationship	Value in second report
location	10° MSQ	must equal	10° MSQ
date	year	must equal	year
date	month	must equal	month
location	1° MSQ	must equal	1° MSQ
date	day	must be within 1 of	day
time	hour	must be within 1 of	hour

If any condition in Table K4–1 is not met and if no special deck allowances apply (see sec. 4.2), the two reports are considered unique. If all the conditions are met, then seven individual weather elements are checked for equality: wind speed. visibility, present weather, past weather, sea level pressure, air temperature and sea surface temperature. If day and hour match exactly between two reports, then the following conditions determine whether reports are unique:

If 7 common elements are present in both reports, only 2 can be unequal.

If 6, 5, or 4 common elements are present in both reports, only 1 can be unequal.

If 3, 2, 1, or 0 common elements are present in both reports. 0 can be unequal.

When day and/or hour do not match exactly between reports. then the same seven weather elements are checked for equality. The following conditions determine whether reports are unique:

If 7 common elements are present in both reports, only 1 can be unequal.

If 6, 5, 4, 3, or 2 common elements are present in both reports, 0 can be unequal.

If 1 or 0 common elements are present in both reports, consider the reports unique.

4.2 Special Allowances

Some data sources or deck numbers were found to have certain problems that require special treatment within the dupelim plan. Without these special allowances many reports would be considered unique when they were actually dups.

1 Temperatures off by < 1° (any match with decks 116, 119, 555, or 899). * Test air and sea surface temperature to whole degrees only. If air and/or sea surface temperature are still not equal between two reports, add 0.9 to the lower value, giving A, and test that the other temperature is less than or equal to A.

* "Any match" includes matches within a category (e.g., another 116 can match 116 under # 1), and "vs." in other allowances means only between the specified categories,

For example, suppose a report matches deck 899 in location and time, but air and sea surface temperature are not equal between reports:

	Air temperature	Sea surface temperature
any deck	24.2	22.8
deck 899	24.0	23.4

Each temperature between the two reports is tested to whole degrees. This yields equal air temperature but unequal sea surface temperature. Adding 0.9 to the lower sea temperature gives 23.7. Since 23.4 is less than 23.7 the two sea temperatures are now considered equivalent.

2 Present weather off by units digit (any match with the Atlas). Present weather might not always be equal between two dups. This is true in the Atlas, where present weather was some times changed slightly when run through quality control. For example. two reports could be exactly the same except for a present weather of 60 in one report and 62 in the other. Therefore, to eliminate all dups. present weather is tested only to the tens digit.

3 Wind ranges used to test for equality (all decks). Wind speed conversion problems exist throughout the marine data base. These

discrepancies have occurred because of confusion over the ”old” (official WMO) and ”new,” (only used in the HSST) Beaufort scales, and also because of the change–over from wind speeds estimated to those measured. Therefore, to eliminate dups, ranges of wind speed based on midpoints of the ”old” and ”new” Beaufort scales and the original ranges of the two scales are used to determine equality (see sec. 5.9). In addition, tests were made with actual data to ensure the validity of this scheme.

4 Pressure to whole millibars (deck 192 vs. HSST and any location and time match with decks 555 or 899). Pressure is first tested to whole millibars. If pressures are still not equal, then for deck 192 vs. HSST matches one–tenth millibar is added to the HSST value and then another test for equality is made to tenths of a millibar. For location and time matches with deck 555 or deck 899, one–tenth millibar is added to the lower value and then a test for equality is made to whole millibars.

5 Temperatures lost digits (deck 193 vs. HSST decks other than 192). Air and sea surface temperature problems occur in some HSST reports that match deck 193. If air temperatures are equal between reports and sea temperatures are also equal no further action is needed. When one or both of these temperatures do not match, the values must be tested digit by digit. The temperatures are considered exact when two digits out of three are equal and the unequal digit in the HSST report is zero or blank (signs must also be the same). Otherwise, they are unequal. For example, temperatures 20.3 and 0.3 would be equivalent using this scheme.

6 A 6– or 7–hour time difference (deck 193 vs. HSST Indian). A 6– or 7–hour difference occurs in almost all HSST–deck 193 matches in octant 8 of the HSST Indian basin. A special hour check is performed when the location, year, and month of the HSST report match that of a report in deck 193. When this type of match occurs and hour is greater than the tolerance in the main dupelim plan (± 1 hour), hour is given a new tolerance of +6 or +7 (hour of deck 193 minus hour of HSST, taking into account day crosses). This tolerance is allowed for all deck 193–HSST matches in the Indian basin regardless of octant.

7 Wind speed conversion problem (deck 189 vs. HSST Indian and Atlantic). When location, date, and time in deck 189 match a report in the HSST file, wind speeds might not be equal because of a conversion problem. If wind speeds are equal between the two reports, no action is required. But, if the wind speeds are not equal (about half the time), the original value in the supplemental data field of the HSST report must be reconverted from meters per second directly to knots. A test for equality is then performed.

8 Wind speed old/new Beaufort mix (deck 192 vs. HSST Atlantic). HSST reports that match deck 192 were erroneously sent in the ”old” Beaufort

scale instead of the "new" scale. HSST reports must, therefore, be reconverted to knots using the "old" scale.

When two reports met the conditions applied to all data sets and. if applicable, any of the special allowances just described, they are considered dups. The "best" dup or the report to be retained is determined by quality code (see supp. J).

5. Pre-'70s Duplicate Elimination Refinements

Refinements to the specifications given in sec. 4 were made in order to define related outputs or data changes, to handle unspecified conditions, or to clarify the exact implementation.

5.1 Inventories

For each 10° box, counts of the following were made:

1) for each year-month
   I, O, D,

2) for each year
   I, O,D for each source ID,

3) for total of all year-months
   a) I, O,D for each source ID,
   b) I, O,D for each deck,
   c) grand total I,O,D,
   d) grand total dup status.
   e) a table of QC flag counts for each variable, where

I = input number of reports,
O = output number of reports.
D = number of uncertain dups retained (NCDC rile is 0 minus D).

NOTE: Owing to subsequent reprocessing, the QC flag counts are not accurate. They should be used only as estimates.

These counts were written out for each extant 10° box in a packed binary format described in sec. 7.5. In addition, items 3a) through 3e) were automatically printed out at the completion of each 10 box within every run listing, plus the start and end year-month.*

* Extensive checks were performed by NCDC on these run listings, in order to determine if dupelim was working properly. In addition, comparisons were made with similar inventories produced for the Atlas data set and for the earlier TD–1100 data base. (Steurer, P. M., 1983: Checks and Comparisons of 1983 Inventories for Pre 1970's Surface Marine Data. Unpublished NCDC technical report, 11 pp.)

5.2 Lat/Lon Tenths Positions

The latitude/longitude indicator (XYI) in LMR (see supp. F) for each deck was set as given in Table K5-1 .

Table K5-1
Lat/Lon Indicator Settings

Deck	XYI	Deck	XYI
*110	1	555	0
116	0	666	0
*117	1	849	0
118	0	850	0
119	0	876	0
128	0	877	0
143	0	878	0
150	0	879	0
151	2	880	0
152	2	881	0
155	2	882	0
156	2	888	0
184	0	889	0
185	0	891	0
186	0	897	0
187	0	898	0
188	0	899	0
189	0	900	0
*192	1	901	2
*193	1	902	0
*194	2	926	0
*195	1	927	0
*196	1	928	0
197	0	999	0
*281	1		

* For these decks, the tenths position of longitude and latitude (X,Y) was adjusted from the corner (0,0) to the center (5,5) of the 1° MSQ. All these decks were consistently at (0,0) except that decks 192-194 had a number of anomalous values that were printed out for reference before being changed. In deck 194 these values were already (5,5). Deck 194 was later subject to substitution of tenths from HSST, hence the XYI of 2. (A substitution was made into deck 194 from all matching HSST reports with a tenths numeral other than 5, in order to save any tenths of degrees that were available in the HSST.)

5.3 Priority List

The Atlas was automatically selected over the HSST, for example. in most cases because it had more weather elements. To select between dups with equal quality codes, a priority list by source ID (Table K5-2) was used.

Table K5-2
Priority by Source ID

Priority	Description	Source ID
1	NODC	11
2	NODC Supplement	12
3	Atlas	1
4	IMMPC	17
5	OSV	8
6	OSV Supplement	9
7	MSQ 486 Pre-1940	10
8	Supplement B	5
9	Supplement C	6
10	HSST Pacific	2
11	HSST Atlantic	4
12	HSST Indian	3
13	Australian	16
14	Japanese	14
15	Eltanin	13
16	S. African	15
17	Monterey Telecom.	7

For example, in an Atlas Monterey match with equal quality codes, the Atlas was retained. However, in an Atlas-Atlas match with equal quality codes the choice was the second report (in sort order) for convenience.

5.4 Bathythermographs

Bathythermographs were tested for dups only among themselves (ship type 7), but without distinction between XBT or MBT.

5.5 Day or Hour Cross

A report was allowed to vary by ± 1 hour and still be considered a dup. The hour cross included a match between hours 23 and 00 of the next day, and a match under allowance # 6 (6- or 7-hour difference) as special cases. A report was allowed to vary by ± 1 day and still be considered a dup, but the two hours were required to match exactly.

A missing/erroneous day was automatically considered unique, but dupelim was performed on the ”hour” consisting of all missing/erroneous hours in a given 1° MSQ-day, with no cross allowed.

5.6 Certain and Uncertain Dups

Dup certainty depends on three factors: 1) whether a day or hour cross was involved, 2) whether at least one report was GTS (from the Global Telecommunication System), 3) the number of common weather elements in agreement. Table K5–3 defines uncertain (U) and certain (C) dups in terms of these factors.

Table K5-3
Certain/Uncertain Definitions

		≥ 1 GTS*								0 GTS								
	common	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
dif	7																	no cross
	6																	no cross
	5																	no cross
	4																	no cross
	3																	no cross
	2																	no cross
	1	C	U	U						U	U	U						no cross
	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	no cross
dif	7																	hour cross
	6																	hour cross
	5																	hour cross
	4																	hour cross
	3																	hour cross
	2																	hour cross
	1	C								U								hour cross
	0	C	C	C	C	C	C			C	C	C	C	C	C			hour cross
dif	7																	day cross
	6																	day cross
	5																	day cross
	4																	day cross
	3																	day cross
	2																	day cross
	1	U								U								day cross
	0	U	U	U	U	U	U			U	U	U	U	U	U			day cross

* Note that for the pre-'70s, GTS comprised two known decks: 555 and 999.

5.7 Dup Status and Dup Check

The dup status (DS) in LMR (see supp. F) was set according to the code:

0 = unique
1 = best dup
2 = best dup with substitution
3 = worse dup, uncertain with hour cross
4 = worse dup, uncertain with no cross
5 = worse dup, uncertain with day cross
6 = worse dup, certain with hour cross
7 = worse dup, certain with no cross

Reports with a DS of 6 or 7 were never output; i.e., the LMR file contains all reports with DS < 6. The TD-1129(M) file contains all reports with DS < 3. For the purpose of DS = 2, a substitution was any one of those given in sec. 5.8. The dup status, once set for a report, could possibly be changed to a higher value (worse) but not lower.

The dup check (DC) in LMR (see supp. F) is missing for all unique reports (DS=O) and was set for all other reports that matched at least one other report (DS < 6).

- 0 = GTS and logbook match with sea level pressure and sea surface temperature match(under allowances).
- 1 = GTS and logbook match without sea level pressure and sea surface temperature match.
- 2 = not GTS and logbook match.

The dup check, once set for a report, could possibly be changed to a lower value (better) but not higher.

5.8 Substitution of Parameters Between Dups

Three substitutions were made between dups:

1) Longitude and latitude tenths positions from matching HSST into deck 194 (sec. 5.2).
2) Calm wind speeds and associated wind indicator from matching HSST into deck 194.
3) Total cloudiness matched under allowance # 10 (sec. 5.10) was substituted from HSST into any deck 192 report with total cloudiness missing.

5.9 Wind Allowances

The wind allowances # 3, # 7, and # 8 (sec. 4.2) were written assuming that the NCDC converted TD-11 would be used rather than the

Exchange format directly. Therefore, these allowances were handled as follows.

#3 Wind ranges used to test for equality (all decks). The meters–per–second column in Table K5–4 was used.

Table K5–4
Wind Ranges for Equality

Knots	Meters per second
0.0 × ⩽ 1.5	0.0 × ⩽ 0.8
1.5 × ⩽ 4.5	0.8 ⩽ 2.3
4.5 × ⩽ 8.0	2.3 ⩽ 4.1
8.0 ⩽ 12.0	4.1 ⩽ 6.2
12.0 ⩽ 16.5	6.2 ⩽ 8.5
16.5 ⩽ 21.5	8.5 ⩽ 11.1
21.5 ⩽ 27.0	11.1 ⩽ 13.9
27.0 ⩽ 33.0	13.9 ⩽ 17.0
32.0 ⩽ 39.0	16.5 ⩽ 20.1
38.0 ⩽ 46.0	19.6 ⩽ 23.7
45.0 ⩽ 53.0	23.2 ⩽ 27.3
53.0 ⩽ 63.5	27.3 ⩽ 32.7
63.5 ⩽	32.7 ⩽

End–points are doubly inclusive; e.g., if two wind speeds were 0.8 and 2.3, they were considered equal. This allowance was applied to both estimated and measured wind speeds before July 1963 (exclusive). From July 1963 onward this allowance was applied only if one of the two winds being compared had an indicator showing it was estimated; otherwise the two winds were given a tolerance of 0.6 m s–1 (approximately 1 knot) for equality.

7 Wind speed conversion problem (deck 189 vs. HSST Indian and Atlantic). This allowance was no longer applicable since wind speeds in both the regular and supplemental sections of LMR were in meters per second and identical before bracketing.

8 Wind speed old/new Beaufort mix (deck 192 vs. HSST Atlantic). This was handled by applying these rules for bracketing all estimated winds in both the HSST Indian and Atlantic, and without any requirement for a match with deck 192:*

a) If wind was at a ”new” midpoint then it was put at the corresponding ”old” midpoint.
b) Otherwise it was checked using the ”old” ranges and put at the appropriate ”old” midpoint.

* Inadvertently, bracketing never occurred during dupelim processing, with largely unknown effects on the selection of dups. The problem goes back when data were converted from the Exchange format to LMR. The Exchange format

had indicators for speed and direction (the point compass) and speed (whether the wind speed was estimated or unknown, or measured). Wind indicators showing the wind speed as estimated or unknown were conservatively interpreted as meaning unknown, and set to missing in LMR, but the direction indicator was set correctly. Bracketing was eventually done during conversion from LMR to CMR (supp. E), according to the method of allowance # 8, and modified wind data were put through QC again in order to regenerate wind flags.

Tests run on the HSST Atlantic tapes picked out what ”new” midpoints were usually used. Tests run on the HSST Indian tapes showed only ”old” midpoints used. All the ”old” values and the remaining anomalous values were subject to b). The midpoints and the ranges used are given by Table K5–5 .

Table K5–5
Beaufort Midpoints

Beaufort number	”Old” midpoint ($m\ s^{-1}$)	”New” midpoint ($m\ s^{-1}$)	”Old” range ($m\ s^{-1}$)
0	0.0	0.8	0 ⩽ × 0.2
1	1.0	2.0	0.3 ⩽ 1.5
2	2.6	3.6	1.6 ⩽ 3.3
3	4.6	5.6	3.4 ⩽ 5.4
4	6.7	7.9	5.5 ⩽ 7.9
5	9.3	10.2	8.0 × ⩽ 10.7
6	12.3	12.6	10.8 ⩽ 13.8
7	15.4	15.1	13.9 ⩽ 17.1
8	19.0	17.8	17.2 ⩽ 20.7
9	22.6	20.8	20.8 ⩽ 24.4
10	26.8	24.2	24.5 ⩽ 28.4
11	30.9	28.0	28.5 ⩽ 32.6
12	35.0	32.2	32.7 and above

* Ranges were taken from [12].

5.10 Other Allowances

The following allowances were added (see secs. 4.2 and 5.9 for information on allowances #1 through #8):

#9 Automatic retention of deck 193 (deck 193 vs. HSST Indian and Atlantic). Without this allowance the HSST dups would usually have been retained because pressure was deleted from deck 193. However, the pressures in the HSST were not corrected for gravity, so deck 193 is preferred (especially since it kept the pressure in the supplemental).

#10 Automatic retention of deck 192 (deck 192 vs. HSST decks other than 192). Without this allowance the HSST dups would usually have been retained because they may contain total cloudiness, and wet bulb and dew point temperatures. However, the wet bulb and dew point temperatures were computed from relative humidity (available in 192 supplemental), and the total cloudiness was substituted into deck 192, so deck 192 is preferred.

5.11 1° Landlocked File and 5° Limits for QC

Tapes supplied by NCDC were used. Unfortunately, a set of revised limits planned for use was on a 4° latitude x 5° longitude grid; furthermore it was not finished. Lack of time made it impossible to change the existing limits.

6. ’70s Duplicate Elimination

The same program as that used for pre–’70s data (sec. 5) was used, except for changes as follows.

6.1 Priority List

Because of the different source ID makeup, a new priority list was needed, this time by deck (Table K6–1).

Table K6–1
’70s Priority by Deck

Priority	Name	Deck
1	IMMPC	926,927
2	NODC	891
3	non–GTS other	mix
4	non–555 GTS	mix
5	Monterey Telecom.	555

Note that the order of the NODC and IMMPC is reversed from that of the pre–’70s; after the pre–’70s was finished this was thought to be a better choice because of data completeness.

6.2 Day or Hour Cross

Treatment as for the pre–’70s data. except that allowance #6 was no longer in force and no day cross was permitted.

6.3 Certain and Uncertain Dups

Treatment as for the pre–’70s data, except that GTS comprised eight known decks: 555, 666, 849, 850, 888, 889. 999. Decks 849–850, FGGE data, were considered GTS although then may have been mixed.

6.4 Substitution of Parameters Between Dups

None was made.

6.5 Wind Allowance

Only allowance # 3 remained in effect, since no HSST data were included.

6.6 Other Allowance

Only # 1 remained in effect, its scope broadened to include deck 888, thus:
1 Temperatures off by < 1° (any match with decks 116, 119, 555, 888 or 899).

6.7 QC Subroutine

The '70s Decade (SID 18) and some other sources have already been QC'd by NCDC, but the new QC was applied to all data in order to provide consistent criteria for dup selection. The old flags are available in the supplemental and the new flags in the QC attachment of LMR.

7. Dupelim Production Program

The duplicate elimination program (dupelim) was written according to the specifications in secs. 4–6. The following is a description of how the program performs the tasks of locating and eliminating dups. Although the QC subroutine is an important part of dupelim, it is described separately in supp. J .

The program was written in an extended version of the FORTRAN 77 programming language (CRAY–1 FORTRAN) used on the CRAY–1 computer at NCAR. Figure K7–1 is an abbreviated diagram to give the reader a better understanding of how the program processes the data.

7.1 Initializing for a Box

One or more consecutive 10° boxes can be processed during a run of the program. At the beginning of each box all arrays and variables used for summing (of monthly and yearly, inventories, etc.) are set to zero, the landlocked and limits data for the QC subroutine are read and stored, and pointers are set so the first report will be input into the First index location of the storage buffer (a two–dimensional array).

Input is in the form of Long Marine Reports (LMR) as described in supp. F . After the first report is unpacked, the checksum is recomputed and compared with the stored checksum. The checksum is computed only for the First report in each box, as a time–saving measure.

7.2 Storage and Flow

The dupelim specifications require that data for two consecutive days be compared. to allow for a day cross between dups (within the same year, month, and 1° MSQ). To keep track of each day of data in storage and to avoid having to move reports around once they are input and unpacked, the data are input to the buffer into consecutive array locations, and pointers set to indicate the beginning and ending locations of both days of data.

After the first report for a box is input, data are read until a new year, month, 1° MSQ. or day is encountered. As the data are input, the variables required for dupelim and QC are unpacked and stored in one–dimensional arrays (one array for each variable. dimensioned the same length as the buffer) at the same index location as the packed report in the buffer.

After a report is unpacked, its lat/lon indicator is assigned, the report moved to the center of its 1° MSQ for specified card decks, its 1° MSQ number computed. and the implied bucket indicator set for HSST data with missing bucket indicators and extant sea surface temperatures.

First, dupelim is performed internal to day_1 day_2 is then read and positioned in the buffer directly following day_1 Second, dupelim is performed across day_1 and day_2, and third. internal to day_2. At this point day_1 can be output, freeing up the buffer space that it occupied.

Successive days of data will be read, processed, and output until, when the buffer is full, reports are read into the top of the buffer again, provided that space is no longer being used. Figures K7–2 through K7–4 describe a sequence of this ”circular buffer” process.

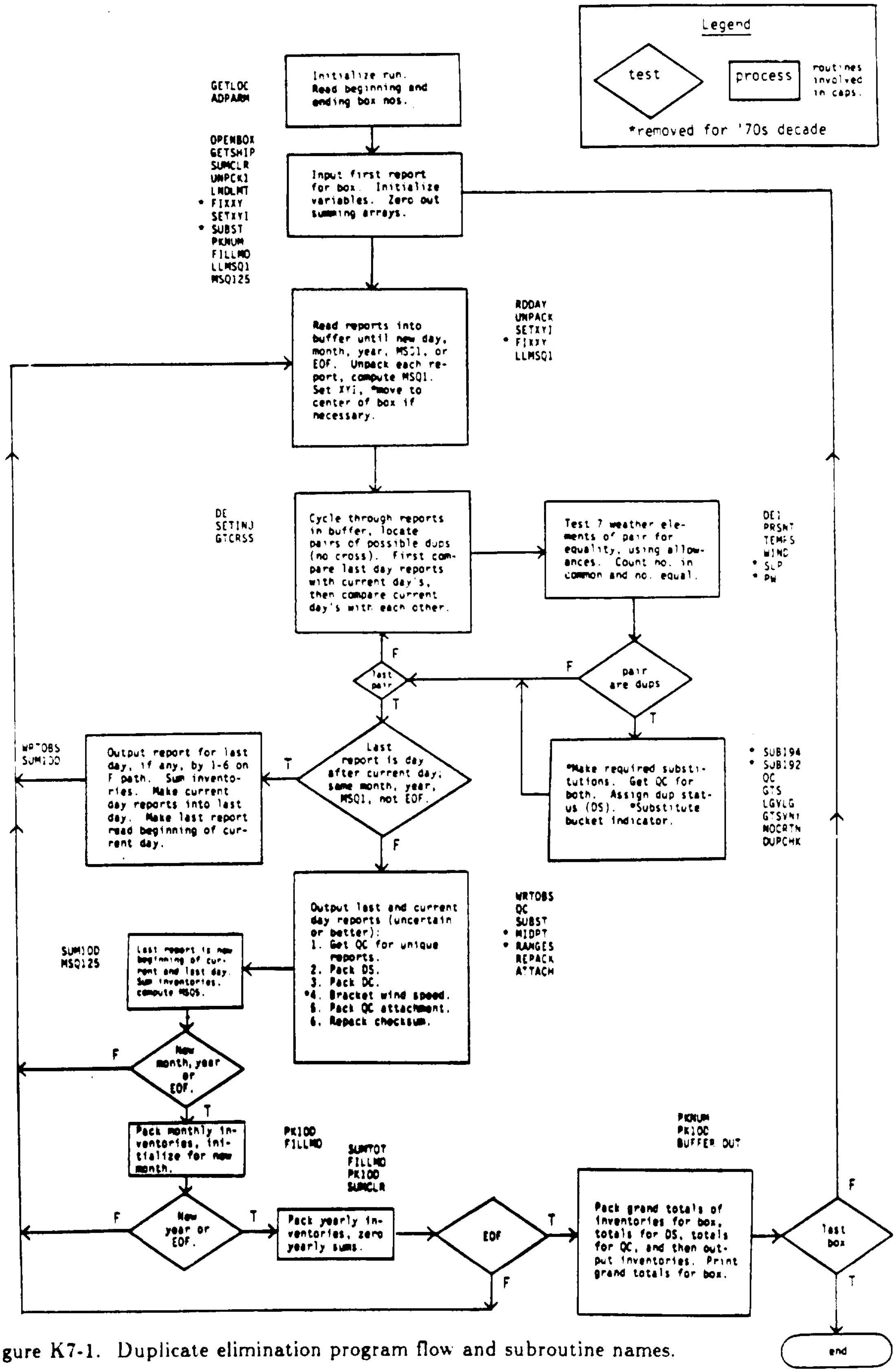


Figure K7-1. Duplicate elimination program flow and subroutine names.

BUFFER
day$_1$
day$_2$
first report of day$_3$
free

Figure K7–2. Two full days of data plus the report of day$_3$ in buffer.

BUFFER
free
day2
first report of day3
free

Figure K7–3. Day$_1$ is output, space is no longer used.

BUFFER
day$_3$
first report of day$_4$
free
day$_2$
day$_3$

Figure K7–4. Day$_3$ is input, occupies bottom and top of buffer.

The following terminology will be used when referring to days of data:

day$_i$ = the day just read
day$_{i-1}$ = the day immediately before day$_i$
day$_{i+1}$ = the first report after day$_i$

There is always a day$_{i+1}$ in the buffer, since this report is the first one read that has a different day, month, 1° MSQ, etc. than day$_1$. On the other hand, there may not be a day$_{i-1}$, (i.e., the data skip a day, month, etc.), in which case the pointer for the beginning of day$_{i-1}$ is equivalenced to the pointer for the beginning of day$_1$, and the pointer for the end of day$_{i-1}$ is set to zero to indicate that there are no data in day$_{i-1}$. Once day$_{i-1}$ and day$_i$ have gone through dupelim, if day$_{i+1}$ is in the same 1° MSQ, month, and year as day$_i$, and it is also the next consecutive day, then day$_{i-1}$ is output, day$_i$ becomes day$_{i-1}$, and day$_{i+1}$ is the beginning of the new day$_i$. Otherwise, day$_{i-1}$ and day$_i$ are both output, day$_{i+1}$ becomes the first report of day, and there is no day$_{i-1}$. Then the remaining reports are input for the new day.

7.3 Locating Duplicate Reports

Once the very first day’s reports are input, they are scanned for possible pairs of dups by locating reports that are both XBT or not both XBT and have the same hour, are different b) 1 hour, or are different by 6 or 7 hours (allowance 6). The following is an example of possible reports in a day:

Example 1.	index location	Hour
	1	1
	2	1
	3	2
	4	3
	5	8
	6	10
	7	23

The order by index location in which comparisons might be made is

(1,2),(1,3),(1,4),...,(1,7),(2,3),(2,4),...,(6,7)

But since the reports are sorted by hour, once the hour difference is greater than 7 there is no need to corr-pare later reports, so the pairs (1,6) and (1,7) are skipped on,er and the next comparison made is (2,3). These pairs are possible dups:

(1,2) – no cross
(1,3) – hour cross
(1,5) – hour cross (allowance # 6)
(2,3) – hour cross
(2,5) – hour cross (allowance # 6)
(3,4) – hour cross
(3.5) – hour cross (allowance # 6)
(4,6) – hour cross (allowance # 6)

When a pair is located, its seven weather elements (sea surface temperature, air temperature, sea level pressure, present weather, past weather, wind speed, and visibility) are compared. If weather elements exist in both reports, they are tested for equality, using allowances when applicable. A count is kept of the number of weather elements present and the number that are equal between the pair, and these counts as well as the type of cross between the pair determine whether or not they are dups.

When a pair is identified as dups, substitutions are made if required (wind speed from HSST into Atlas, etc.) and quality codes are assigned by QC to each report. The dup status (DS) is assigned according to the values of the quality codes unless one of the reports is HSST and the other is from deck 192 or 193, in which case the latter is chosen over the HSST. If the quality code is the same for both reports, the one with highest priority according to its source ID is the best dup.

In cases where one or both dups already have a dup status (they are also dups with other reports), their values can be changed to a higher (worse) value but not lower. This means that a best dup may become uncertain or worse (or it may remain a best dup) but an uncertain or worse dup will not be made a best dup.

The dup check (DC) is then assigned to both dups according to whether both are GTS, as determined from the card deck of each report. If both are GTS or both are logbook then DC is 2. If one is GTS and the other is logbook then DC is 0, provided both sea surface temperature and sea level pressure are equal within allowances; otherwise DC is 1. If the dup check has been set for one or both reports already, its value can possibly be changed to a lower number but not higher.

Finally, if one report of a pair of dups has a bucket indicator of 2 and the other report has sea surface temperature present but the bucket indicator is missing, it is replaced with a value of 2.

After dups are located in day_i and those reports become day_{i-1}, the next day of reports is input and becomes the new day_i. Since day_{i-1} has already been checked internally, it is necessary to compare only day_{i-1} with day_i, and then to compare day_i internally.

Given the reports in Example 1, suppose a second day of reports is read in with the following hours:

Example 2.

index location	Hour
8	0
9	1
10	5
11	5
12	10
13	20

Comparisons are made in this order:

(1,9) – day cross
(2,9) – day cross
(6,12) – day cross
(7,8) – hour cross
(7,10) – hour cross (allowance # 6)
(7,11) – hour cross (allowance # 6)
(8,9) – hour cross
(10,11) – no cross

After dups within these pairs are located, the reports in the first day that are not worse may be output.

7.4 Preparing Reports for Output

Preparing reports for output (uncertain or better) requires these steps:

a) Get the quality code and flags for the unique reports.
b) Pack the new dup status into LMR.
c) Pack the new dup check into LNIR.
d) Pack the quality code and flags (QC attachment) into LMR.
e) Repack the new checksum into LMR.

Not all of the variables in LMR are unpacked after input since this would be a waste of computer time and storage. Instead, packed LMR are maintained in storage, and whenever a value is to be substituted into a report the coded value is packed and the checksum is adjusted accordingly. The checksum is not repacked with each substitution, however, since it may be changed again if there are further substitutions throughout the program. The recomputed checksum, modulo 255, is repacked just prior to being output.

Quality control data are returned from the QC subroutine in two parts, the packed flags and the quality code, which together become the first attachment in LMR. Since there may already be a supplemental and error attachment, the QC attachment must be inserted between the control section of LMR and any existing attachments. This is done by moving the other attachments to temporary locations, packing the quality control attachment to the end of the control section, and repacking the other attachments at the end of it.

7.5 Inventories

The inventories (see sec. 5.1) for each 10° box (BOX10) are stored in one variable-length record in a binary bit-string format, with a maximum record length of 198,240 bits, and one record per block. The method of storing data is similar to that used for other packed binary products (see supp. F , for example). Owing to a different number of card decks and source IDs, the formats of the pre-'70s (INV.1) and '70s (INV.2) were slightly different. For distribution these have been consolidated as two separate files in a single format (INV.3), which is identical to INV.2 except that end-of-file marks within the pre-'70s and '70s have been removed. The format for each record is given in Table K7-1 .

Table K7-1
Inventories, Formats: INV.1/INV.2/INV.3

#	Field	Bits	Repeat	Repeat specification
1	BOX10	10	1-180	For each 10° box.
2	YEAR−1799	8	2-8	For each year with data.
3	I_m	*15	3-5	For each of the 12 months.
4	O_m	*15		
5	D_m	*15		
6	I_{sidy}	*15	6-8	For each of the 17 source IDs (INV.1),
7	O_{sidy}	*15		or
8	D_{sidy}	*15		for each of the 24 source IDs (INV.2/INV.3).
9	YEAR = 0	8	9-180	Once following the last year of data.
10	I_{sid}	*20	10-12	For each of the 17 source IDs (INV.1),
11	O_{sid}	*20		or
12	D_{sid}	*20		for each of the 24 source IDs (INV.2/INV.3).
13	I_{cd}	*20	13-15	For each of the 49 card decks (INV.1),
14	O_{cd}	*20		or
15	D_{cd}	*20		for each of the 50 card decks (INV.2/INV.3).
16	I_t	*20		
17	O_t	*20		
18	D_t	*20		
19	DS_0	*20		
	.	*20		
	.	*20		
	.	*20		
26	DS_7	*20		
27	$QC_{1,1}$	*20		
28	$QC_{2,1}$	*20		
.	.	*20		
.	.	*20		
.	.	*20		
40	$QC_{14,1}$	*20		
41	$QC_{1,2}$	*20		
42	$QC_{2,2}$	*20		
.	.	*20		
.	.	*20		
.	.	*20		
180	$QC_{14,11}$	*20		

Further descriptions of the information in Table K7–1 follow:

- Field

The fields are abbreviated as follows:

I = number of reports input
0 = number of reports output
D = number of reports output that were uncertain dups
DS_k = number of reports by dup status
$QC_{i,j}$ = QC flag

subscripted:

m = monthly total
sidy = yearly total by source ID
sid = grand total over all time by source ID
cd = grand total over all time by card deck
t = grand total over all time
k = grand total over all time of dup status k
i,j = grand total over all time of flag i for flag value j

(see Table K7–2)

Table K7–2
$QC_{i,j}$ Flags (i) and Values (j)*

i	Flag	Flag	value
1	ship position	1	missing
2	wind	2	R
3	visibility	3	A
4	present weather	4	B
5	past weather	5	J
6	pressure	6	K
7	air temperature	7	L
8	wet bulb temperature	8	m
9	dew point temperature	9	N
10	sea surface temperature	10	Q
11	cloud	11	S
12	wave		
13	swell		
14	pressure tendency		

*Because of subsequent reprocessing, QCi are not accurate. They should be used only as estimates.

- Bits

When a number (z) is too large to store in n bits
(i.e., $x \geqslant 2^n - 1$), it is stored in multiples of n bits. This

possibility is indicated by prefixing the bits entry with an asterisk. In this case the first n bits are filled with all ones and the difference $(x - (2^n - 1))$ is stored in the next n bits if it will fit. If the difference is still too large, this step is repeated until the difference, including a possible difference of 0, can fit into n bits.

Likewise, when unpacking the inventories, if the number unpacked is $2^n - 1$, the next n bits are unpacked and added to the first number. This is done repeatedly until the number unpacked is less than $2^n - 1$.
NOTE: When the inventories are being unpacked, if the unpacked value for the year is 0 before adding 1799, grand totals for the box follow. Otherwise, zero 10 the number of reports.

7.6 ’70s Decade Dupelim

Most of the changes in dupelim for the ’70s decade involved removal of allowances and substitutions pertaining to HSST data, since there were no HSST data in the ’70s. Figure K7–1 indicates some of the changes made for the ’70s data.

These changes were also included:

1) No day cross. However, two days of data are still in the buffer at one time to allow for the hour difference of hour 23, day_{i-1}, vs. hour 0, day_i.

2) Locating dups. Since Allowance # 6 is no longer applicable and a day cross is not allowed, the number of comparisons made between reports is reduced. Hence, in Example 1 the order for comparisons would be (1,2), (1,3), (2.3), (3,4), etc.

3) Priority. For equal quality codes. one is chosen over the other by card deck instead of source ID (see sec. 6.1).

4) Additional source IDs and card decks. Some source IDs and card decks in the pre–’70S data were nonexistent in the ’70s. The new source IDs were added to the old list for the inventories and output listing rather than removing the old ones. The additional card deck, was inserted into its sequential position among the other card decks.

5) Allowance #1. One more card deck (888) was added.