Intergovernmental
Oceanographic
Commission

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GUIDE TO IGOSS DATA ARCHIVES AND EXCHANGE (BATHY AND TESAC)

REVISED EDITION

1985 Unesco

CONTENTS

CHAPTER I

1. INTRODUCTION

1.1 PURPOSE

1.1.1 This guide is intended to document the procedures to be followed in processing and archiving BATHY/TESAC data in the RNODCs for IGOSS and the World Data Centres for Oceanography. It describes the arrangements developed between IODE and IGOSS to share data so as to better serve the needs of users. It is also intended to provide information on IGOSS data collection, data flow and data archival for scientists and engineers who wish to use the data and who are not familiar with the system.

1.2 GENERAL

1.2.1 The Integrated Global Ocean Services System (IGOSS) is the international operational system for global collection and exchange of oceanic data and the timely preparation and dissemination of oceanographic products and services. The Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO) co-operate in the planning and implementation of IGOSS. The operation of IGOSS is based on national efforts and depends on the full support of all IOC and WMO Member States. The timely dissemination of telecommunicated data and/or products depends on the facilities of the Global Telecommunications System (GTS) of the World Weather Watch (WWW) of the WMO.

1.2.2 IGOSS consists of three major elements. These elements are:

(i) The IGOSS Observing System (IOS) consisting of various facilities and arrangements for obtaining standardized oceanographic information from ships-of-opportunity, research ships, ocean weather stations, fixed and drifting buoys, aircraft and other platforms;

(ii) The IGOSS Data Processing and Services System (IDPSS) consisting of national, specialized, and world oceanographic centres for the timely processing of observational data and the provision of products and services to marine user groups, for short term data archiving and for near real time and delayed mode exchange activities; and

(iii) The IGOSS Telecommunications Arrangements (ITA) consisting of telecommunications facilities of the WWW, GTS and other arrangements necessary for the rapid and reliable collection and distribution of the required observational data and processed information.

1.2.3 International Oceanographic Data Exchange (IODE) is the international system for the archival and non-operational exchange of all types of oceanographic data and for the provision of relevant marine data products in information and services. IODE is developed under the auspices of the IOC. It is based on the following major elements:

(i) Internationally agreed arrangements for international data exchange and data management.

(ii) The World Data Centres A and B for Oceanography in Washington and Moscow with responsibilities for the archival and exchange of oceanographic data and selected products on the global basis.

(iii) The Responsible National Oceanographic Data Centre (RNODC) system with various specific agreed processing, archival and exchange responsibilities in support of the World Data Centre System and the principles of IODE.

1.2.4 The operation of IODE is also based on national efforts and depends on the efforts of the IOC Member States to support the World Data Centre system and through the provision of RNODCs and the IOC Working Committee on IODE, members of the Task Teams and the Groups of Experts developing the techniques and mechanisms for IODE.

1.2.5 The IGOSS and IODE activities were originally designed to meet the requirements of basically different user communities. Practical considerations and the development of recent international scientific programmes have led to the requirement of an integrated IGOSS/IODE data management system to serve a full spectrum of users with an expanding variety of needs. The goals of IGOSS and IODE can be summarized as follows:

IGOSS: To provide timely operational oceanographic data, products (including data sets) and services to users involved in marine activities and the management of international scientific programmes.

IODE: To provide accurate and complete oceanographic data bases, synthesized data sets and products to users concerned with the advancement of the knowledge and understanding of oceanographic processes and oceanic conditions over time and space.

1.2.6 Consideration of these goals leads to a realization of a similar and different requirements of the two systems.

(i) Both systems require observational data.

(ii) The timeliness of IGOSS requirements overide other considerations to a certain extent and there must be some sacrifice in the quality of the data and the completeness of the databases.

(iii) The quality and completeness of IODE requirements similarly demand that there must be some sacrifice in the timeliness of the data bases.

1.2.7 Considerable joint and individual efforts have been and will continue to be expended by IGOSS and IODE to overcome the problems of timeliness, quality and completeness. IGOSS is continually improving the quality control techniques in use and is moving in the direction of increased automation. IODE is streamlining the submission of data via the national data centres to the RNODCs and WDCs and is expediting the development of more efficient formatting schemes and of improved data centre services to marine users and international scientific programmes.

1.2.8 The Guide deals primarily with oceanographic data collected under IGOSS and reported in the BATHY and TESAC reporting codes (the WMO code forms-FM63 V (BATHY - Temperature) and FM64 V (TESAC - Temperature/ Salinity/Currents). As other types of IGOSS data begin to flow on the GTS (e.g., oceanographic surface data along a ship track, drifting buoy data containing subsurface information, etc.) additional mechanisms will have to be developed between IGOSS and IODE.

1.3 DEFINITION OF TERMS

1.3.1 Annex A contains definitions of terms commonly used in IGOSS and IODE literature. They will also be used in this Guide and are defined for the convenience of the reader.

1.4 PUBLICATIONS, RELEVANT TO IGOSS/IODE DATA MANAGEMENT

1.4.1 Manual on International Oceanographic Data Exchange (Fifth Edition)

This manual is No. 9 of the series of Manuals and Guides published by the IOC. The purpose of the "Manual on IODE" is to assemble in a convenient form, the procedures, resolutions, recommendations and various documents concerned with the exchange of oceanographic data of all kinds.

1.4.2 Guide to Operational Procedures for the Collection and Exchange of Oceanographic Data (BATHY and TESAC)

This Guide is No. 3 of the series of Manuals and Guides of the IOC Guide No. 3 is published jointly by the IOC and WMO. The purpose of the Guide is to describe the procedures and techniques of IGOSS (BATHY and TESAC) data collection, data encoding, data routing, error checking and quality control and monitoring.

1.4.3 Guide to IGOSS Data Processing and Services System (IDPSS)

This Guide is published jointly by the IOC and WMO and is intended to be a general guide to IDPSS for the information of nations, organizations, or individuals wishing to participate in the system and/or utilize its products.

1.4.4 Guide for IGOSS Specialized Oceanographic Centre (SOC)

This Guide is being prepared jointly by the IOC and WMO to explain the concept behind SOCs, detail the types and functions of different SOCs and explain the procedures for establishing them. It is planned to publish this Guide in 1985.

1.4.5 Guide to Data Collection and Location Services using Service Argos

This Guide is published by WMO (WMO, Marine Meteorology and Related Oceanographic Activities, Report No. 10, 1983) and is intended to be a general guide for the utilisation of the System Argos, and a source of reference material for the design and constuction of buoy hardware.

1.4.6 The IOC General Magnetic Tape Format for the International Exchange of Oceanographic Data (GF-3)

This Guide is No.9,Annex I of the series of Manuals and Guides of the IOC and was published in three parts. The IOC General Format 3 is a system for formatting different types of oceanographic data onto magnetic tape for international exchange among data centres andis suitable for the archival of certain data. Part I is the technical specification for GF-3. In conjunction with Part II, containing the fixed code tables, it is the manual for using GF-3 to prepare data for exchange and to read data received. Part III is a kind of user's guide which is intended to familiarize the user with the purpose and scope of the GF-3 formatting system, without overburdening him with technical detail.

1.4.7 Guide for Responsible National Oceanographic Data Centres (RNODCs)

This Guide is No 9 Annex II of the series of Manuals and Guides of the IOC. The Guide summarizes the guidelines now used for the operation of RNODCs, gives a description of existing RNODCs and offers guidance for the accreditation and operation of RNODCs.

CHAPTER II

2. IGOSS/IODE DATA MANAGEMENT

2.1 PRINCIPLES OF IGOSS/IODE DATA MANAGEMENT

2.1.1 The development of a data management system requires an understanding of the needs of the user community. For IGOSS and IODE these needs can be met by a data management system having the following five characteristics.

2.1.2 The first necessary requirement of the data management system is timeliness. Timeliness is a relative term. In the case of oceanographic data management, timeliness can only be assessed in terms of the applications supported. These applications range from the forecasting of short term phenomena with time scales of the order of days to the study of interannual variability and long term trends with time scales of decades. Data which becomes available in a few weeks can be very timely to one user but would be much too late for another user.

In general, data for short range weather and climate forecasts, for example, must be available within a few days. Data concerning inter-annual variability must be available within 30 days. Data for research on mechanisms of variability over years to decades is required only on a somewhat longer time scale. However, even for this application data must be made available with greater urgency than has been the case in the past.

2.1.3 The second requirement is for operational data. Historically, only a relatively small amount of oceanographic data are collected and distributed operationally in the meteorological sense. It is important that an effort be made to actively exchange observational information for those systems which have become standardized to the extent that they can be assumed to be utilized by a number of organizations over a number of years. Existing international formats should be utilized where available and developed if not available.

2.1.4 The third requirement is for a quality control of the data. Users must be able to appraise the degree of confidence to be given to data, particularly those data taken by other individuals and organizations. Quality control has two aspects, first with respect to reliability, and second, with respect to remedying deficiencies in the data which result from handling and transmission between the point of the observation and the ultimate user.

2.1.5 The fourth requirement relates to products. Increasingly, the most important material for exchange and archiving is derived from analysis of the data, rather than the data themselves. Close collaboration among data collectors, data centres and data users is essential for this purpose.

2.1.6 The final requirement is completeness. A primary problem facing users is the inability to gain access to a complete data set. The data exchange and archiving systems must ensure that potential users are provided with ready access to as complete a data set as can be made available and in as timely a manner as possible.

2.2 DATA COLLECTION ACTIVITIES

2.2.1 Data collection activities are the responsibility of Member States. The data are collected in support of national programmmes which are usually of a research, survey or monitoring nature and are related to oceanographic research programmes, ocean climate or baseline studies or operational programmes producing summaries and forecasts of ocean conditions.

2.2.2 The organizations collecting data of interest to IGOSS will, in general, be oceanographic institutions, meteorological institutions or operational agencies that are multi-tasked to gather the data. In some cases the data may be acquired through voluntary ships-of-opportunity programmes arranged by the organization requiring the data.

2.2.3 An important source of reliable subsurface data for IGOSS is drifting or moored buoys, particularly in areas not adequately covered by ship observations. Part of the data from these buoys is made available internationally in real time via the GTS. The data are generally available in other code forms such as DRIBU. Principles and procedures for collection, temporary archiving and exchange of the DRIBU code data are described in the "Guide to Data Collection and Location Services using Service Argos". At the same time a considerable portion of the drifting and moored buoy data is not exchanged in real time. It is desirable that efforts be made by the IGOSS and IODE systems to make these data available both operationally and for IODE purposes.

2.2.4 Where feasible, and where suitable arrangements have been made on behalf of the IGOSS programme, data are abstracted either manually or automatically from the original record. These data are forwarded via radio telecommunications facilities to shore-based receiving stations for onward distribution to national and international users of the system.

2.2.5 IGOSS data are collected by a variety of methods. The platform may be a ship, aircraft, ocean weather station, satellite, drifting buoy or moored buoy. Data handling on the platform and transmission to the shore-based facility which will insert it onto the GTS depends on the nature of the operation on the platform. The data handling may be manual, semi-automated or totally automated. The platform may be manned or unmanned. In the simplest case the data may be abstracted manually from the original record, transcribed by hand to coding forms and radio transmitted by voice or morse code to the shore-receiving station. On the other hand the data may be computer abstracted, transmitted automatically via satellite and inserted onto the GTS without any manual intervention.

2.2.6 The method by which the data proceeds from the sensor to the GTS is of interest for two reasons. The first is timeliness. In general the data from automated systems could be expected to reach the GTS, and thus the users, more rapidly than data requiring substantial manual processing. Secondly, systems involving manual processing can be expected to be more error-prone than automated systems. Automated systems are therefore to be encouraged.

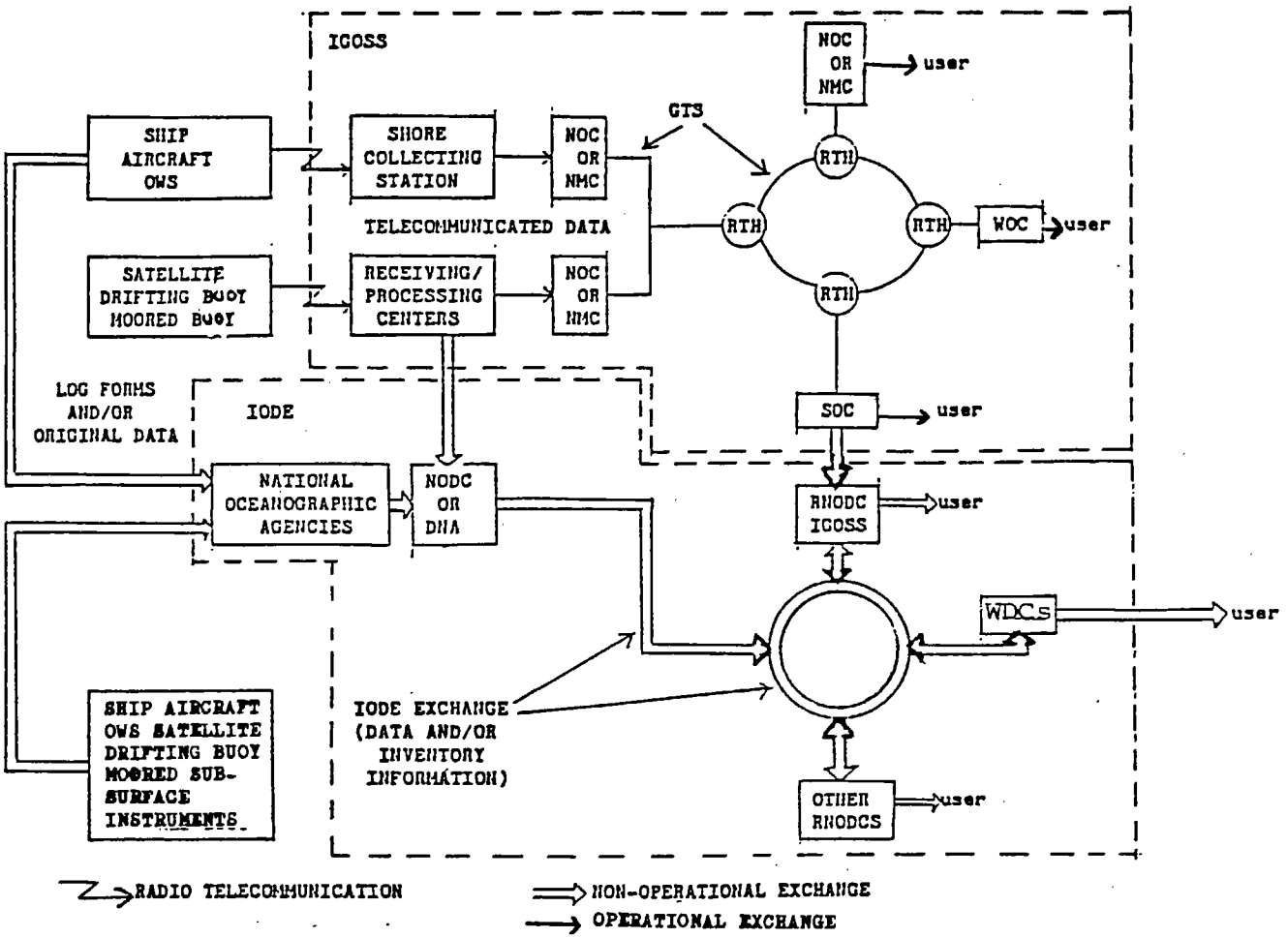


Figure 1. The IGOSS/IODE Data Flow Diagram

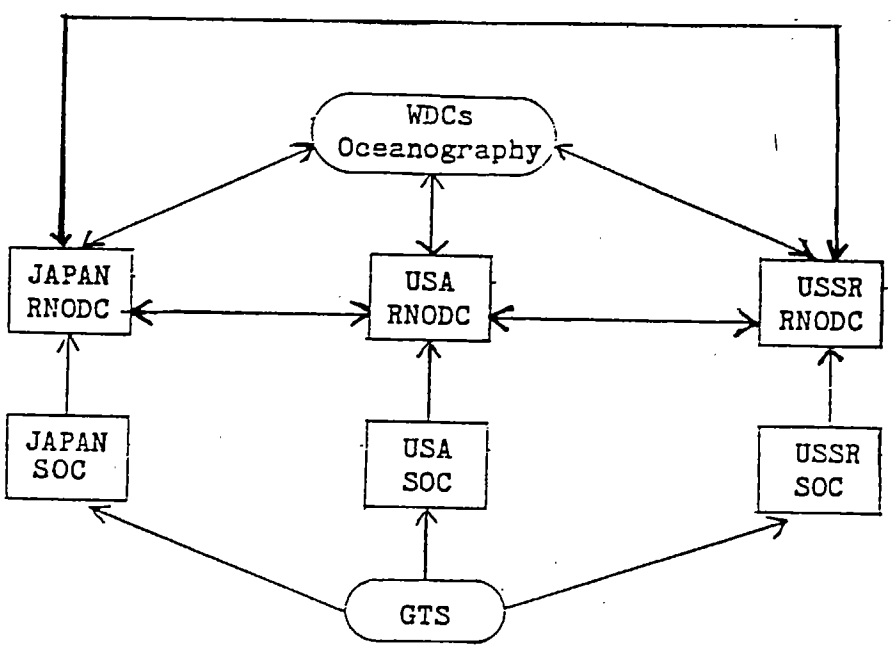


Figure 2. Data Flow between IGOSS-SOCs and IODE-RNODCs

2.3 PRINCIPAL ARCHIVING COMPONENTS

2.3.1 A brief description of the principal activities and components which play a role in the IGOSS data archiving scheme are given in the following paragraphs.

2.3.2 National Meteorological Centres or National Oceanographic Centres are agencies of Member States which provide services in response to national priorities. Certain of these agencies receive IGOSS data, in real time, carry out quality control checks and error correction, prepare the necessary telecommunication bulletins and enter the data on the GTS for national and international distribution. Certain NMCs or NOCs (acting as SOCs) maintain files of IGOSS data and also provide the link to IODE by compiling the IGOSS operational data on magnetic tape and supplying it to an RNODC-IGOSS on a monthly basis.

2.3.3 The Responsible National Oceanographic Data Centres for IGOSS (RNODCs-IGOSS) are some of the National Oceanographic Data Centres (NODCs) which have accepted additional responsibilities for IGOSS data. They provide comprehensive archives of IGOSS data and assume exchange and service obligations for specified regions of the world's oceans on a voluntary but more or less permanent basis. RNODCs are usually NODCs which are well equipped with processing and computer facilities(or have access to such facilities) and thus are in a position to aid in the systematic exchange of IGOSS data and in the provision of services to "secondary" users. The responsibilities of the RNODCs-IGOSS are described in Chapter III.

2.3.4 World Data Centres A and B for Oceanography operate under the auspices of ICSU. In terms of IGOSS they are concerned with the maintenance of inventories of data, the provision of data referral services, the co-ordination of requests for data and with a mutual exchange of data which they receive on an annual basis from the RNODCs-IGOSS. The WDCs also participate in monitoring of the non-operational data flow.

2.4 STRUCTURE OF THE IGOSS/IODE DATA MANAGEMENT SYSTEM

2.4.1 The system shown in Figure 1 consists of an IGOSS and an IODE component. The system is complex. Data can enter the system and reach the user by a number of different routes. The route chosen by a particular user will be selected on the basis of a compromise between the urgency of the need and the quality and completeness of data needed to meet the requirement. If the data are required in a few days then only the telecommunicated data of IGOSS will be available and there may not be time to determine and apply the final most accurate instrument calibrations. On the other hand, if the data are not required for a few months or even a year or two, a higher quality and more complete data set can be compiled. The data set will be more complete because data collected but not telecommunicated will have time to reach the system by normal exchange mechanisms.

2.4.2 The IGOSS component is based on an operational data flow using telecommunication facilities. This component contains, in general, data which has been radio-transmitted. The time frame in which the data and products are available for IGOSS activities extends from one day to two months. The accumulated operational data set is forwarded to the RNODCs-IGOSS at the end of each month.

2.4.3 The IODE component is based on the traditional international and national exchange mechanisms of the RNODC and World Data Centre systems. The IODE system deals with all types of oceanographic data including high resolution data sets from research cruises and monitoring exercises. IGOSS data enter the IODE system via two routes: an operational data set is forwarded to the RNODCs-IGOSS at the end of each month; the original data accompanied by additional information are forwarded to national oceanographic agencies and then handled by IODE centres. The time frame in which data sets and products are available from the IODE system ranges from two months, for simple data sets and products, to several months or years for complex integrated multidisciplinary data sets for long term variability studies. Further details on IODE mechanisms and procedures can be obtained from the "Manual on International Oceanographic Data Exchange" (IOC Manuals and Guides No. 9).

2.5 BATHY/TESAC DATA FLOW WITHIN IGOSS

2.5.1 The flow of BATHY/TESAC data within the IGOSS system, the procedures to encode the data and route it to the GTS, are described in detail in IOC Manuals and Guides No. 3, "Guide to Operational Procedures for the Collection and Exchange of Oceanographic Data (BATHY and TESAC)". A short summary is included here to enable the reader to focus on points of importance to the processing and archiving of the data in IODE centres. Sample BATHY and TESAC forms are included in Annex B.

2.5.2 All BATHY/TESAC data originates at a sensor in a data collection instrument associated with a ship, satellite or buoy. The parameters measured are temperature, salinity and currents as a function of depth. In order for the data to reach the operational centres of IGOSS, observations must be encoded either manually or automatically into the appropriate reporting code (report) and transmitted within a BATHY/TESAC radio message via radio telecommunication facilities to national agencies.

2.5.3 BATHY/TESAC data can enter the operational dissemination system as radio messages to a coastal radio station, transmitted by morse code or voice. It can also enter the system by other telecommunications facilities including satellite re-transmission. The coastal radio station or other shore facility routes the radio messages to an NMC or NOC that has accepted the responsibility to compile various reports into a bulletin which is entered in a BATHY/TESAC GTS message on the GTS.

2.5.4 The NOC or NMC is the first point of quality control for IGOSS data. The quality assessment and error correction is carried out prior to insertion of the data on the GTS. IGOSS quality control is discussed in more detail in the later section.

2.5.5 Once the data are transmitted on the GTS, it is available simultaneously to all NOCs/NMCs, SOCs and WOCs. Each receiving centre performs additional quality control and then uses the data to prepare products and/or operational data sets for distribution to its community of users. This is the second point of quality control for IGOSS data.

2.5.6 The operational data sets prepared in IGOSS SOCs will generally be the only form in which the data will be available for the first two months after its collection. Users requiring the data in this time frame have to contact the appropriate SOC. After two months, data sets containing the telecommuinicated data and possibly additional data from other sources will be available from the RNODCs-IGOSS.

2.5.7 The IGOSS data reaches the RNODCs-IGOSS through certain IGOSS SOCs (Figure 2) which have the responsibility to supply magnetic tapes of the telecommunicated data to these centres (see Chapter III). When the data are received in the RNODCs-IGOSS further quality control and, where possible error correction, are carried out. This is the third and final point of quality control for the IGOSS data.

2.5.8 BATHY/TESAC messages following the route described in the previous paragraph should be encoded as shown in Part III of the BATHY and TESAC coding forms in Annex B; Parts I, II and IV of the coding forms should also be completed and sent along with the original record to the national oceanographic agency operating the data collection programme. This agency should include the form or the information from the form with the fully processed data when it is forwarded to the National Oceanographic Data Centre of the Member State. Data encoded in Parts I, II and IV are beneficial to the management of IODE and increase the value of the data to secondary users. The NODC is responsible for forwarding the data to the appropriate IODE centres as required by the international agreements described in Manual No 9 "Guide to International Oceanographic Data Exchange".

2.5.9 Automated data and data which require subsequent processing prior to submission to IGOSS, such as data telemetered from ship-based computers or moored and drifting buoys, pass through satellite or other receiving centres. The data are processed, encoded in the BATHY or TESAC reporting code and entered on the GTS, usually through special national arrangements.

2.5.10 Non-operational data from these sources should be processed and forwarded to an NODC along with all available additional information. The NODC is responsible for forwarding the data to the appropriate IODE centres.

2.5.11 The procedures described above are in general used in most Member States. This does not preclude other national arrangements, should circumstances demand. However, any alternative arrangements must provide for timely transmission of the data on the GTS in either the BATHY or TESAC approved code.

2.5.12 The first quality control point for the BATHY/TESAC data occurs just prior to entry of the data on the GTS. Regardless of the route by which the data have reached this point, it is mandatory that a minimum set of internationally agreed quality control checks be applied and error correction be carried out should the circumstances warrant. The quality control checks to be performed at this point are given in Annex C.

2.5.13 The second point of IGOSS data quality control occurs when the data are taken from the GTS. Within IGOSS centres data sets are continually being compiled. This permits improved quality control checking. The centre can, for example, examine series of reports from one ship or buoy or compare physical values from nearby observations. Annex D contains the internationally agreed minimum set of quality control checks to be applied at this point. The checks and error corrections are to be carried out prior to the preparation of data products or of data sets for the delivery of operational data.

2.5.14 There are three types of errors which can occur in the messages. Messsage format errors are those errors which concern the abbreviated heading of a bulletin and the end of message signal. Coding errors are errors which concern the code forms for BATHY or TESAC reports. Physical errors concern the measured or observed values such as data/time of the observation, position, depth, temperature, salinity, current, wind speed, wind direction or air temperature.

2.5.15 Several studies have shown that a significant percentage of BATHY and TESAC reports contain errors that can easily be corrected. These errors are of three types and are possible to detect by examination of a telecommunicated data set without reference to the original data. Such subtle errors as those arising from minor instrument malfunctions or miscalibration, poor choices of inflection points by the observer encoding the message or inacurate reading techniques are not considered in this classification. [Error correction should only be performed at this point when there is considerable confidence that the proposed change is valid. The quality control applied at this point can only be based on the content of the single BATHY or TESAC bulletin being prepared.]

2.5.16 In general, BATHY/TESAC data should be entered on the GTS in as timely a manner as is consistent with good data handling practices. If it is not possible to accomplish the entry within a few hours or very few days, the data are still useful. Data can and should be transmitted on the GTS up to thirty days after the time of the observation.

2.6 DATA FLOW WITHIN IODE

2.6.1 Data flow in the IODE system is generally based on computer magnetic tapes exchanged between IODE centres by mail or courier rather than by telecommunication facilities. Data are collected by ships, aircraft, satellites, ocean weather stations and fixed and drifting buoys. These collection facilities are the responsiblity of national oceanographic institutions gathering data for their research, survey or monitoring programmes. In some cases the national agency will be participating in an international programme and additional arrangements for data flow other than those described below may be negotiated.

2.6.2 The traditional route for IODE flow begins with the national oceanographic agencies. The data from the ships and buoys are processed and assessed by subject specialists. Instrumental performance is evaluated and final calibration corrections are determined and applied. When the specialists are satisfied that the quality of their data is established and that it has been properly processed, the data are ready to be forwarded to the National Oceanographic Data Centre or Designated National Agency for international exchange, as appropriate.

2.6.3 It is important to recognize that some portion of the data discussed above would have been telecommunicated in an early and probably less complete form to the IGOSS system. This telecommunicated data will reach the IODE system via the transfer of the operational data from the specialized IGOSS centres to the RNODCs-IGOSS. Care must be taken by IODE centres that any resulting duplication of data is deleted and the appropriate duplicate record is removed from, or flagged in, the data bases.

2.6.4 The time frame within which oceanographic data are processed by the national oceanographic agencies and submitted to the NODCs is quite variable. Member States are urged to hasten the data submission where possible. However, experience has taught that the goal of data submission within one year is not usually being met. In spite of the best efforts of IODE, much data does not reach the system for three to four years and some does not arrive for some time after that. There is also a body of data which is reported on the GTS but is never submitted through the National Oceanographic Data Centres to the IODE system. IGOSS operational data sets clearly must be available to prepare integrated data sets, if these data sets are to meet the completeness requirements of international scientific programmes.

2.6.5 Once the data have reached the NODCs, international exchange can proceed according to whatever arrangements are in place at the time. The arrangements that are in place will depend both on the traditional IODE guidelines and on ad hoc arrangements developed in the framework of data management plans to meet the needs of particular international programmes. Therefore, the NODC may be required to place data and/or inventory information in a specified format and supply it to a World Data Centre and one or more RNODCs. Upon the completion of the tasks assigned to an RNODC, it in turn, will send data to WDCs Oceanography for final archiving.

2.6.6 The IGOSS operational data sets are forwarded by the IGOSS SOCs to the RNODCs-IGOSS (on magnetic tape) on a monthly basis. It is the responsibility of the RNODCs-IGOSS to process the data and be prepared to make the data and data inventories available to users on (a) request basis within one month following receipt of an operational data set. This ensures that the data are available from the IODE system two months after the observation data.

2.6.7 The archiving of IGOSS data taken from the GTS in the RNODCs-IGOSS of the IODE system is not to depend on data reaching the RNODCs via a route other than the GTS.

2.6.8 The GF-3 format is available to be used for the delivery of IGOSS data from the SOCs to the RNODCs-IGOSS. Annex E contains specifications for the GF-3 subset designed for this purpose. This does not preclude other mutually agreed arrangements between two specific centres providing the format includes all data fields and quality flags carried in the GF-3 format in Annex E.

2.6.9 The third point of IGOSS data quality control (see also p.2.5.12 and 2.5.13 for the first and second points of IGOSS data quality control) occurs at the RNODCs-IGOSS. The procedures applied here can be more stringent than either of the previous two checks. The RNODC has available more extensive data holdings and can, for example, compare the new data to historical data for the area and time span to assist in detecting errors. Each RNODC should be prepared to provide information on their quality control procedures to users of the data.

2.6.10 When the quality control procedures have been completed the data are archived. The RNODCs are required to maintain complete archives of all operational BATHY/TESAC data received from IGOSS for their ocean area of responsibility. It will therefore be necessary that regular exchanges occur between the RNODCs to acquire data which is received in one centre but which is in the ocean area of responsibility of another (Figure 2).

2.6.11 The internal format in which the operational BATHY/TESAC data is archived in the RNODCs is not of concern to IODE or to IGOSS. However, the archival files must accomodate all fields and flags contained in the GF-3 format in Annex E.

2.6.12 The responsibility of the World Data Centres (Oceanography) for the international exchange of IGOSS data includes the archival of the BATHY/TESAC data, the provision of inventory information on their data holdings and those of the RNODCs-IGOSS and assistance to Member States requesting data. In order that the WDCs have on hand the necessary information to meet these responsibilities, the RNODCs-IGOSS are to prepare and submit copies of their BATHY/TESAC data and inventories of their holdings to the WDCs on an annual basis. The RNODCs are also to be prepared to provide inventories and data to other users on request.

2.7 IODE ARCHIVAL AND DISSEMINATION OF BATHY/TESAC

2.7.1 When request for the BATHY/TESAC data are received by the RNODCs or the WDCs the data should be supplied on magnetic tape in the GF-3 format of Annex E. This subset has been designed to accomodate all necessary fields and quality control flags. These flags are also to be used to provide information on edits applied by the RNODCs in the third phase of quality control.

2.7.2 The RNODCs are, as part of their responsibilities, required to prepare integrated data sets of BATHY/TESAC data. However, it is clear there is a need for integrated data sets of subsurface temperature, salinity and current data from other sources in the development of knowledge of ocean and climatological processes and in developing histories of the behaviour of oceanic variables. NODCs in Member States requiring such integrated data sets can, and should, request the BATHY/TESAC data from the RNODCs and integrate it with other data holdings.

2.7.3 If the integrated data set is required by an international programme two possible methods are available. The programme may be supported by a specialized data centre, such as an ad hoc RNODC, established to provide data management services. In this case the specialized centre can obtain BATHY/TESAC data from the RNODCs-IGOSS and integrate it with the data it holds from other sources in the programme. If such a centre does not exist, the programme may, by special arrangement seek the service from one of the existing RNODCs-IGOSS.

2.7.4 In addition to providing inventory information and data on request, the RNODCs are required to archive selected data products produced by the SOCs and prepare products as appropriate. Information on the types of products and their availability can be obtained from the RNODCs.

CHAPTER III

3. IGOSS DATA REPOSITORIES

3.1 GENERAL

3.1.1 This chapter is intended to furnish the most current information on the identity of individual activities and centres concerned with archiving and exchange of IGOSS data and to describe briefly the specific tasks and functions each centre is presently performing or plans to perform.

3.1.2 It is anticipated that with the continued development and broadening scope of the IGOSS programme, additional facilities will participate in the IGOSS data archiving and exchange scheme and additional tasks, functions and responsibilities will be assumed by these activities. Amendments to, and revisions, of the material in this chapter must therefore be expected.

3.1.3 "Area of Responsibility" in the framework of IGOSS is defined as the geographic area for which an RNODC assumes the obligation to compile, maintain and render exchange services from complete IGOSS data bases. It should be noted that for the present there is some deliberate overlap between the areas of responsibility of the various RNODCs.

3.1.4 "Area of Interest" includes both the area of responsibility of the RNODC and any additional for areas which it wishes, for national or regional purposes, to receive and archive IGOSS data.

3.1.5 For this edition of the Guide it is convenient to arrange the material in a summary form according to the type of archiving activity as given in the following sections.

3.2 RESPONSIBLE NATIONAL OCEANOGRAPHIC DATA CENTRES

3.2.1 U.S. National Oceanographic Data Center

3.2.1.1 Responsibilities include both RNODC data functions and U.S. national data functions.

3.2.1.2 Area of Responsibility. Eastern North Pacific, South Pacific Ocean, Atlantic Ocean and Arctic Ocean.

3.2.1.3 Area of Interest. All ocean areas.

3.2.1.4 Data to be received:

From U.S. SOC, WOC, Ocean Products Center, NOS/NWS Washington:

(a) BATHY and TESAC data from SOC respective area of responsibility;

(b) IGOSS data products from SOCs respective area of responsibility.

From NODCs, DNAs and RNODCs:

(a) BATHY and TESAC data as may be arranged.

From U.S. national activities:

(a) BATHY and TESAC logs and analog records

(b) IGOSS data products.

3.2.2 U.S.S.R. National Oceanographic Data Centre

3.2.2.1 Responsibilities include both RNODC data functions and U.S.S.R. national data functions.

3.2.2.2 Area of Responsibility. North Pacific west of 180 degrees, Baltic Sea and North Sea, Indian Ocean, Mediterranean Sea, North Atlantic Ocean.

3.2.2.3 Area of Interest. All ocean areas.

3.2.2.4 Data to be received:

From U.S.S.R. SOC (WMC, Moscow):

(a) BATHY, TESAC and DRIBU data for area of responsibility;

(b) Selected data products (by arrangements).

From NODCs and DNAs:

(a) IGOSS related data inventories upon request.

(b) IGOSS data for area of responsibility (by arrangement).

From other RNODCs - IGOSS:

(a) BATHY and TESAC reports as required.

From U.S.S.R. national activities:

(a) BATHY and TESAC logs.

(b) ROSCOP reports.

(c) Buoy data.

(d) Inventories of IGOSS-related data bases.

From RNODC-Drifting Buoys (when established):

(a) Delayed mode buoy data.

3.2.3 Japan Oceanographic Data Centre

3.2.3.1 Responsibilities include both RNODC functions and Japanese national data functions.

3.2.3.2 Area of Responsibility. Pacific Ocean.

3.2.3.3 Area of Interest. Pacific and Indian Oceans.

3.2.3.4 Data to be received:

From Japan SOC (JMA, Tokyo):

(a) BATHY, TESAC and DRIBU data for area of responsibility.

(b) IGOSS data products.

From other SOCs by request:

(a) BATHY and TESAC data from GTS for Pacific Ocean.

(b) IGOSS data products for Pacific Ocean.

From NODCs, DNAs and RNODCs by request:

(a) BATHY and TESAC Data for Pacific Ocean.

From Japanese national activities:

(a) BATHY and TESAC logs.

(b) IGOSS data products.

3.3 WORLD DATA CENTRES FOR OCEANOGRAPHY

3.3.1 World Data Centre-A for Oceanography, Washington, and World Data Centre-B for Oceanography, Moscow, receive and exchange between themselves on an annual basis BATHY/TASAC data and inventories from the RNODC-IGOSS.

3.3.2 WDCs manage IGOSS data base inventories as provided by the RNODCs-IGOSS.

3.3.3 In respect to IGOSS data users, the WDCs' chief functions are to provide a referral service to IGOSS data holdings and to co-ordinate requests for IGOSS data, data products and data services. Requests for BATHY/TESAC data sets should be directed to the appropriate RNODC-IGOSS.

3.4 FUNCTIONS OF THE RNODCs-IGOSS

3.4.1 The terms of reference for the RNODCs-IGOSS were reviewed and revised at the Joint IOC/WMO Meeting of Experts on IGOSS/IODE Data Flow held in Tokyo, Japan, 12-16 November 1984. The revised terms of reference are as follows:

(a) acquire BATHY, TESAC data sets and sub-surface temperature data from drifting and moored buoys from IGOSS Specialized Oceanographic Center (SOC) for area of responsibility;

(b) apply supplementary quality control to acquired data and provide services to users after 30 days from receipt of that data;

(c) archive, and make available to users, selected data products from SOCs and analysis centers;

(d) acquire non-operational BATHY, TESAC and sub-surface temperature data from drifting and moored buoys and/or data sets for area of responsibility;

(e) apply quality control to non-operational data, prepare integrated data sets and provide services to users;

(f) provide for exchange of IGOSS data in GF-3 format with other RNODCs or to other users as requested;

(g) maintain a data base and inventories for areas of responsibility;

(h) prepare products based on operational and non-operational IGOSS data, as apropriate;

(i) transmit annually to the WDCs data sets in GF-3 format, inventories and selected data products.

(j) prepare summaries and location plots for BATHY, TESAC and sub-surface temperature from drifting and moored buoys and transmit to the IOC Secretariat every 15 August and 15 February for data received during the previous six months;

(k) participate in efforts to monitor data flow;

(l) participate as feasible in IOC training programmes;

(m) provide for exchange of documentation and software regarding quality control and processing procedures, with other RNODCs, as possible.

ANNEX I

DEFINITION OF SELECTED TERMS COMMON TO IGOSS AND IODE

GENERAL TERMS

Area of Interest

It includes both the area of responsibility of the data centre and any additional areas for which it wishes, for national or regional purposes, to receive and archive IGOSS data.

Area of Responsibility

The geographic area for which a data centre assumes the obligation to compile and maintain oceanographic data and to render services from complete IGOSS data bases.

Data Collection

The collecting of oceanographic data by organizations and/or institutions participating in research, survey or monitoring programmes.

Oceanographic Products

Any analysis, forecast or summary of oceanographic conditions prepared and disseminated to meet the needs of a wide variety of user groups. The parameters presented may include sea-surface temperature and anomalies, sub-surface temperature, mixed layer depth, ocean frontal positions, currents, salinity, sea level anomalies, waves and ice conditions, etc.

Secondary User

Any user of data other than those for whom it was originally collected.

Timely

Timely means in this context, the time appropOriate for a particular type of data collected and the use to be made of them. The duration of the timely period depends essentially on the phenomenon under consideration and the ultimate use of the data.

IGOSS TERMS

Bulletin

A compilation of several reports of the same type (BATHY or TESAC) carried out by a GTS insertion point. A bulletin is entered within a GTS message onto the GTS according to the regulations described in the Manual on the GTS (WMO-No. 386)

GTS. Global Telecommunication System

The GTS consists of the telecommunications facilities of the World Weather Watch of the WMO.

GTS Message

The message compiled by a NMC or NOC containing the bulletin header information, the bulletin, and an end of message information.

NMC or NOC. National Meteorological Centre or National Oceanographic Centre

An NMC or NOC is an operational centre which produces various kinds of oceanographic products and information for providing national needs of the Member States. Its functions are solely the responsibility of the Member States. NOCs of a Member State are an element of IGOSS Data Processing and Services System (IDPSS). NOCs functions are frequently performed by National Meteorological Centres (NMC).

NTL. National Telecommunication Link

An NTL is a telecommunication facility used to transmit meteorological and oceanographic data between national centres and to and from the GTS.

Operational Data

Data within 30 days from the time of observation. Operational data are to be exchanged on the GTS.

Operational Delivery of IGOSS Data

The exchange of IGOSS data by mail or other less rapid means of communication after they have been exchanged over the GTS and after they have been processed and used for the preparation of products in an IDPSS centre. This exchange includes the delivery of operational data to users and to the RNODCs of the IODE system.

Operational Exchange of Data

The exchange of operational data via the GTS or other rapid means of communication.

Operational Products

Products prepared to reach the user in a timely fashion and produced on a regular basis. In IGOSS these products are produced through the IGOSS Data Processing and Services System (IDPSS).

Radio Message

The radio message transmitted from the platform to a shore receiving station and containing the radio address of a meteorological or oceanographic centre, the report(s) and any other information prescribed by radio-telecommunications procedures.

Report

An oceanographic observation coded in an appropriate reporting code and transmitted to shore stations. Reports are then forwarded through national channels to a GTS insertion point where they are gathered into bulletins.

RTH. Regional Telecommunications Hub

RTHs are centres in the Main Trunk of the GTS which have (among others) the responsibility to collect observational data from their zone of responsibility and to transmit such data on the Main Trunk, and to relay the meteorological information from the Main Trunk to the centres not situated on the Main Trunk Circuit.

SOC. Specialized Oceanographic Centre

A SOC is an operational centre which produces various kinds of oceanographic products (including data sets) and information for certain regions or for international scientific programmes and projects. Such a data centre is established in the frame of the IDPSS on request of interested Member States; its location, services and functions are determined by an agreement between interested Member States and are subject to confirmation by the governing bodies of the IOC and WMO.

WOC. World Oceanographic Centre

World Oceanographic Centres are specialized oceanographic centres on the global scale. The WOCs have highly automated facilities and can deal with large volumes of data and use numerical techniques efficiently for the analysis and forecast of large and planetary-scale phenomena. Their IGOSS products are usually available to other centres via the GTS in the form of guidance material to be used for the production of specialized products.

IODE TERMS

DNA. Designated National Agency

The National Agency officially charged with the responsibility of the international exchange of oceanographic data.

Non-operational Data

Data older than 30 days. Non-operational data are not exchanged on the GTS.

Non-operational Exchange of Oceanographic Data

The exchange of oceanographic data accompanied by detailed identification information and other supporting environmental data. Non-operational exchange usually occurs well (months to years) after the time of observation and the data frequently undergo strict quality control. IODE programmes are based on non-operational data exchange.

NODC. National Oceanographic Data Centre

An NODC is the sole responsibility of a Member State. Such a data centre generally serves as a focus for the IODE related activities of the IOC within the Member State and provides information and data to the World Data Centre system.

RNODC. Responsible National Oceanographic Data Centre

An RNODC is a centre that has been established on behalf of the IOC to provide a specific set of services to assist with the international exchange of oceanographic data or to meet the needs of international science programmes. An RNODC may exist on a permanent basis or only for the duration of a project.

WDC. World Data Centre

A World Data Centre is a centre established under the auspices of the International Council of Scientific Unions (ICSU). The World Data Centres for Oceanography are the focus for international oceanographic data exchange within the IOC-IODE system.

BATHY AND TESAC CODING FORMS

PART I CRUISE INFORMATION

BATHY

TYPE	SHIP's NAME	CALL SIGN

INSTITUTION

COUNTRY	PROJECT

CRUISE NO

PART II RADIO MESSAGE INFORMATION

OPTIONAL

MESSAGE IDENTIFIER	DATE (GMT) DAY MONTH YR	TIME (GMT) HOUR MIN	QUAD	LATITUDE DEG MIN	LONGITUDE DEG MIN	WIND DIR SPEED	AIR TEMP i ± TEMPdry	INDICATOR GROUP i_x
JJXX	YYMMJ	GGgg/	Qc	LaLaLaLa	LoLoLoLoLo	$i_u$ddff	N s_nTTT	8888 k_1
							4	

DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP	DEPTH TEMP
ZoZoToToTo	ZZTTT	ZZTTT	ZZTTT	ZZTTT	ZZTTT	ZZTTT	ZZTTT	ZZTTT
00								

OPTIONAL

INDICATOR GROUP	TOTAL WATER-DEPTH i	SS-CURRENT DIR SPEED
66666	N $z_d z_d z_d z_d$	k dDcDcVcVc
	1	

CALL SIGN

PART III STATION and REFERENCE INFORMATION

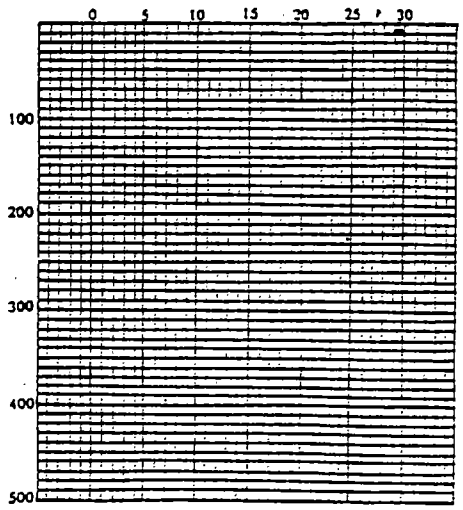
STATION NO.	DEPTH TO BOTTOM

LATITUDE DEG	MIN	Qc	LONGITUDE DEG	MIN	Qc

DATE YEAR	MONTH	DAY	TIME HOUR	MIN

INSTRUMENT TYPE	NUMBER and LETTER

REFERENZ MEASUREMENTS DEPTH	TEMP	METHOD



PART IV ENVIRONMENTAL INFORMATION

WIND DIR	SPEED	HEIGHT of OBS	METHOD

AIR TEMP TEMP dry	TEMP wet	HEIGHT of OBS

PRESSURE	PRECIPITATION	SOLAR RAD

SWELL DIR	PERIOD	HEIGHT	METHOD

WIND WAVES PERIOD	HEIGHT	METHOD

PART I CRUISE INFORMATION

TYPE	SHIP's NAME	CALL SIGN	INSTITUTION

COUNTRY	PROJECT	CRUISE NO.

PART II RADIO MESSAGE INFORMATION

MESSAGE IDENTIFIER	DATE (GMT) DAY	MONTH	YR	TIME (GMT) HOUR	MIN	QUAD	LATITUDE DEG	MIN	LONGITUDE DEG	MIN	OPTIONAL WIND DIR	SPEED	AIR TEMP I	± TEMP dry	INDICATOR GROUP i_x	k_1	k_2
K K X X	Y Y	M M	J	G G	g g	Qc	La La	La La	Lo Lo Lo	Lo Lo	i_u d d	f f	N	s_n T T T	8 8 8		

I N	DEPTH Zo Zo Zo Zo	I N	TEMP To To To To	I N	SAL So So So So	I N	DEPTH Z Z Z Z	I N	TEMP T T T T	I N	SAL S S S S	I N	DEPTH Z Z Z Z	I N	TEMP T T T T	I N	SAL S S S S
2		3		4		2		3		4		2		3		4	
2		3		4		2		3		4		2		3		4	
2		3		4		2		3		4		2		3		4	
2		3		4		2		3		4		2		3		4	
2		3		4		2		3		4		2		3		4	
2		3		4		2		3		4		2		3		4	

INDICATOR GROUP	k_3	k_4	I N	DEPTH Zo Zo Zo Zo	DIR do do	SPEED co co co	I N	DEPTH Z Z Z Z	DIR d d	SPEED c c c	I N	DEPTH Z Z Z Z	DIR d d	SPEED c c c	I N	DEPTH Z Z Z Z	DIR d d	SPEED c c c
6 6 6			2				2				2				2			
			2				2				2				2			

OPTIONAL

INDICATOR GROUP	I N	TOTAL WATER – DEPTH z_d z_d z_d z_d
5 5 5 5 5	1	

CALL SIGN	

PART III STATION and REFERENCE INFORMATION

STATION NO.	DEPTH TO BOTTOM

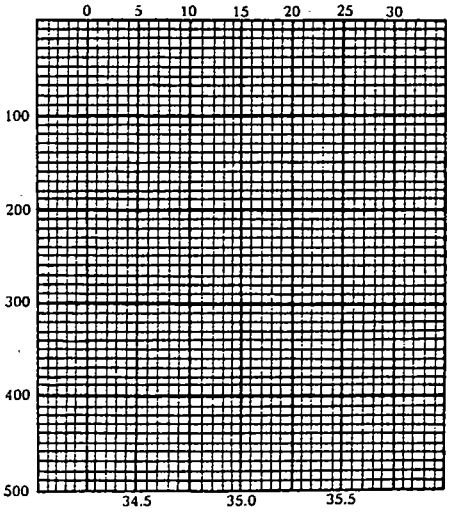
LATITUDE DEGR	MIN	Qc	LONGITUDE DEG	MIN	Qc

DATE YEAR	MONTH	DAY	TIME HOUR	MIN

INSTRUMENT

TYPE	NUMBER and LETTER

REFERENZ MEASUREMENTS	DEPTH	VALUE	METHOD
TEMP			
SAL			



PART IV ENVIRONMENTAL INFORMATION

WIND			
DIR	SPEED	HEIGHT of OBS	METHOD

AIR TEMP		
TEMP dry	TEMP wet	HEIGHT of OBS

PRESSURE	PRECIPITATION	SOLAR RAD.

SWELL			
DIR	PERIOD	HEIGHT	METHOD

WIND WAVES		
PERIOD	HEIGHT	METHOD

MINIMUM QUALITY CONTROL CHECKS TO BE APPLIED TO BATHY/TESAC DATA PRIOR TO GTS ENTRY (GUIDE NO. 3 TO OPERATIONAL PROCEDURES FOR THE COLLECTION AND EXCHANGE OF OCEANOGRAPHIC DATA (BATHY AND TESAC)

It is recommended that the following minimum quality control procedures be used prior to insertion of IGOSS data onto the GTS. These checks concern essentially the correct formatting of BATHY/TESAC Bulletins and are intended to be carried out on a computer using interactive editing procedures. However, if the amount of data is low, the procedures can be carried out manually.

1. Check if a set of reports can be seperated into individual reports.

2. If there are combined reports (two or more strung together) determine if each report contains:

   a) the proper prefix, if not, insert JJXX or KKXX

   b) a call sign, if not - and call sign is known - insert it. If not known, insert "SHIP".

   c) a report separation signal, if not, insert "=" at the end.

3. If there are individual reports, check if the report separation signal "=" appears at the end of every individual report, if not, insert "=".

4. Check if the length of the report is less than 30 characters (Numbers, alphanumerics, and blanks). If so, do not transmit.

5. Check if report contains more than three non-5 digit groups exclusive of the JJXX and call sign. If so, do not transmit.

6. Check if the 5th character of the time group is a "/".

   a) If it is a "9", leave "9" in place (the report is then in degrees Farenheit and depth is in feet).

   b) If it is a "0", replace by "/".

   c) If it is a numeral other than "9" or "0", do not change.

   d) If it is a blank, insert "/".

Note: Formats FM 63-V and 64-V do not recognize characters other than the solidus "/" in the 5th place of the time group. In cases where a national practice has been adopted to use this place to indicate a change such as English units, the GTS insertion centre should strive to correct the format for international exchange, i.e., to insert the solidus and assure temperatures are in degrees Celsius and depth in metres.

7. Check if there are characters other than numbers between JJXX/KKXX and call sign, except for "/" in time group, either correct or delete the group.

8. Check if 8888k/888kk group is present but has missing, incorrect, or additional characters, replace with the correct 888k/888kk group.

9. Check if a 999xx group is followed by a duplicate 999xx group, delete one of the groups.

10. Check if the year indicator is different than the current year, change year indicator to current year. Use caution at the beginning of the current year not to change December reports.

11. Check if the report or set of reports contain excess blanks or non-essential characters, if it does, delete excess blanks and non-essential characters to compress the report or bulletin.

12. Check if the current report is an exact duplicate of a previously transmitted report. If it is, do not transmit.

13. Check if a duplicate report appears in the bulletin under preparation. If it does, transmit only the report that was received last.

ANNEX IV

MINIMUM QUALITY CONTROL CHECKS TO BE APPLIED TO BATHY/TESAC DATA TAKEN FROM THE GTS (GUIDE NO. 3 TO OPERATIONAL PROCEDURES FOR THE COLLECTION AND EXCHANGE OF OCEANOGRAPHIC DATA (BATHY AND TESAC)

The quality control checks described in this Annex will normally be carried out by computer. Changes to data values should only be made if there is a high degree of confidence that the change is warranted. Following the performance of the quality control operations, the appropriate flags must be attached to all physical values before the data are forwarded to users or to the IODE system for archiving. In this document, the position and time values are considered to be physical variables.

a) Check for message format errors

Verification of the message header, abbreviated bulletin headers and the end of message designator indicates that the message is properly formatted and complete, and contains the desired type of report.

1. Determine that the correct beginning (ZCZC) and end (NNNN) groups are present in the message.

2. Determine that at least one correct bulletin (SO) abbreviated header is present in the message. If any of the above fields are incorrect or missing, visual inspection and subsequent correction is required.

b) Check for coding errors

Coding errors are errors in the position or content of those fields or characters which are used to indicate the type, origin, and content of the report as opposed to errors in the physical values in the report.

3. Check that each report in a bulletin begins with JJXX or KKXX and terminates with a valid call sign or buoy number and "=". A missing or invalid call sign should be replaced with "SHIP". A list for valid call signs for ships reporting BATHY/TESAC should be used for this test.

4. Check that position 5 of the time group (group 3) is a "/". If the value is numeric, the report should be inspected to determine that the units of temperature and depth are in degrees Celsius amd metres. Only then should the character be replaced with "/" and the message used. Otherwise, conversion to metric units should be effected, or the message should not be used.

5. If the report is a BATHY (JJXX), check that an 8888k group is present. This group must be in a position 6 or 8 in the report.

6. If the report is a BATHY, check that the 999xx groups are increasing. (99901, 99903, etc.).

7. If the report is a TESAC (KKXX), check that a valid 888k1k_2 group is present where k_1 can be 7 or 8 and where k_2 can have the value 0 through 3 inclusive. The group must be in position 6 or 8 of the report.

8. If the report is a TESAC, check that the sequence 2.3.4 or 2.3 is correct in the report for the depth-temperature-salinity portion of the message. If the 2.3 sequence only is present, the value of k_2 must be zero.

9. Check that the report does not contain any special characters after the "/" in the time field. Check also that, exclusive of the JJXX or KKXX designators and the call sign or buoy identifier, all other fields contain 5 character, numeric groups.

10. The quadrant should be 1, 3, 5 or 7.

If any of the above coding checks detect an error, visual inspection and subsequent correction should follow. If the value of k_2 in check 7 above is incorrect, then k_2 should be set to zero if salinity is not recorded. k_2 should be set to "2" if salinity is present and the proper value of k_2 cannot be determined. If in a report a coding error cannot be corrected, the report should be deleted.

c) Check for physical errors

Physical errors include those such as erroneous position, depth, time, temperature, or salinity values.

11. Check the date and time groups in the report. The data should be valid and be the same as the bulletin date or before the bulletin date. The check should include number of days in the actual month of observation, and it should take leap years into account. If the date is more than 30 days before the bulletin date, an error should be suspected and the report should be inspected and compared with other reports from the same ship and, if necessary, corrected. The time group should have a value between 0000 and 2359.

12. Check the position fields of latitude and longitude. The latitude and longitude fields should be in the range 0000 to 9000 and 00000 to 18000, respectively. The minutes position should have a value less than, or equal to, 59. A time distance check should also be applied between successive reports from the same ship. If the ship could not have travelled the distance between the observations, assuming a speed of 36 knots, then the time, date and position fields should be further investigated for errors. If the maximum speed of the reporting vessel is known, it should be used in lieu of 36 knots.

13. The depth value for both BATHY and TESAC messages should be verified to be in the range of 0000 to 9999 metres. All values of depth within a report should be checked to be sequentially increasing. Two equal values of depth are not permitted. Computer algorithms automatically encoding reports should average the values found if more than one significant point is found within one metre.

14. The sea temperature should be checked to be in the range of -2.4°C to 35°C. There should also be a temperature spike test and gradient test (first and last depths only) applied to the data.

15. The salinity value should be checked to be in the range 0‰ to 40‰. It should be realized that the TESAC message does not distinguish between the old and practical salinity scales. A salinity spike test and gradient test (first and last depths only) should also be applied to the data.

16. The optional meteorological parameters should be checked to be within the ranges given below.

$-40 \leq$ air temperature ≤ 40oC
$0 \leq$ wind direction < 36
$0 \leq$ wind velocity ≤ 50 knots (note that moored automated buoys may provide data in much higher wind conditions)

For all the above checks for physical errors, detection of a suspicious or erroneous value should result in visual inspection of the report. If necessary, other available reports from the same ship should be utilized to determine whether or not subsequent correction is possible. Corrections should only be made if it is considered highly likely that the value to be substituted is correct. For example, a ten degree error in latitude, a month error in date or a ten degree error in temperature, in many situations, can be repaired with considerable confidence.

In all cases, the appropriate flag should be attached to each physical value to indicate whether or not quality control was carried out, the results of that quality control and, finally, to document changed or substituted physical values.

Duplicates check

In all cases, a check for duplicate reports should be carried out to eliminate statistical biases which would arise in products incorporating the same report more than once. The distinction between an exact and an inexact duplicate should be kept in mind. An exact duplicate is a report in which all the physical variable groups (including space-time co-ordinates) are identical to those of a previous report of the same type (BATHY or TESAC) from the same ship. An inexact duplicate will have at least one difference.

Identification of duplicates should be carried out using both date-time call sign and area-time coincidences. If a duplicate is so identified is an exact match, then one report is immediately eliminated.

If the match is inexact, then the abbreviated bulletin header must be examined to determine the action. If there is a three character field in the abbreviated header following the international date time group with the value "COR" then the duplicate is a correction to a previous report, and should replace the previous report.

However, if the abbreviated header does not contain the "COR" field, both reports should be retained and the second should be flagged as a duplicate. To accomplish this, it must be realized that processing, exchange, dissemination and archival systems associated with these data will have to carry a flag, as yet undefined, at the report level.

ANNEX V

STANDARD GF-3 SUBSET FOR OPERATIONAL BATHY/TESAC DATA

1. INTRODUCTION

1.1 This subset has been designed to facilitate the delivery of IGOSS operational data sets to the RNODCs-IGOSS and for use in disseminating these data on magnetic tape to the user community.

1.2 The subset is directly related to the radio message part of the IGOSS format for BATHY and TESAC data. All fields in the radio message, including all optional groups and indicator groups, are directly mappable into the subset. Also included are all the quality control flags generated during the subsequent processing of the radio messages in the IGOSS centres and in the RNODCs-IGOSS.

2. CHARACTERISTICS OF THE SUBSET

2.1 The data are organised into multi-series files according to the record layout illustrated in section 4. Each tape may contain one or more data files, and data from both BATHY and TESAC reports may be mixed in the same file. Within each file the data are not restricted to any particular set order - for example, a file can consist of a cruise or cruises, or it can consist of all the data from a given geographic area or time span.

2.2 Each series is designed to accommodate the data from one BATHY or TESAC message, and consists of a series header record followed by a data cycle record, with data for up to 46 depth levels - if more depth levels are reported, the data are continued on additional data cycle records. If necessary, plain language records may be inserted within the series.

2.3 Both BATHY and TESAC data are stored according to the same record format, as defined by the series header definition and data cycle definition records given in 5.1 and 5.2 respectively. It will be noted that the method code MM in most of the parameter codes has been set to unspecified, i.e. 'XX', as the method of measurement is not transmitted in the BATHY/TESAC radio message - for example temperature may be obtained by bottles, CTDs, BTs or XBTs. The method code is only specified where it is used to identify the code table against which parameters stored in a coded form are expressed.

2.4 The values of date, time, latitude, longitude, sounding depth and platform call sign in the BATHY/TESAC message are stored in the fixed area of the series header record. The remaining part of the record includes the message identifier (indicating whether the data is from a BATHY or a TESAC report), and the reported values (and their quality control flags) of wind speed/direction, air temperature and sea surface current speed/direction - note that wind speed units are standardised to metres/second. Also included is a set of 6 quality control flags for the reported values of date, time, geographic position and sounding depth. All indicators reported in the BATHY/TESAC message are mapped into a special parameter consisting of a string of 20 characters - only the first 7 of which are defined for use at present (see section 3).

Footnote: For a complete description of the GF-3 format please refer to IOC Manuals and Guides No. 9, Annex 1, Parts 1-3. Up to date information on the format is obtainable from RNODC (Formats), ICES Service Hydrographique, Palaegade 2-4, DK-1261 Copenhagen K, Denmark

2.5 Data at the various depth levels are stored in the data cycle record - each data cycle being designed to include sensor depth, sea temperature, practical salinity, current speed and direction, together with their associated quality control flags. Note that the BATHY message does not report practical salinity, or current speed and direction - where a parameter value is not available the appropriate null value is entered as specified in the data cycle definition record. A null value is not specified for sensor depth as a valid value is considered mandatory.

2.6 The mapping of BATHY and TESAC radio messages into this subset is illustrated in section 6.

2.7 An annotated listing of a sample BATHY message, formatted according to the definition records given in 5.1 and 5.2, may be found in section 7 based on the sample radio message given in 6.1. It should be noted that this subset has not been designed to minimise tape usage but rather to simplify software writing - a more compact format could have been achieved by storing the data cycles within the 'user-defined area' of the series header record.

3. GF-3 PARAMETERS

Listed below are all the GF-3 parameters included in the 'user-defined areas' of the subset, as described by the series header definition record and the data cycle definition record (see 5.1 and 5.2). Note that the units given below are those in which the data are retrieved, after the application of the scaling factors given in columns 49-56 and 57-64 of the relevant parameter descriptor in the definition record. Thus, for example, in the 'user-defined area' of the series header record the wind speed is stored on tape in units of 0.1 m/s, wind direction is stored in tens of degrees, while sea surface current speed is stored in units of 0.05144 m/s (i.e. in units of 0.1 knots).

PPPP K MM S

WSPD 7 XX A WIND SPEED (METRES/SECOND)

WDIR 7 XX A WIND DIRECTION FROM TRUE NORTH (DEGREES)
Direction from which the wind is blowing

DRYT 7 XX A DRY BULB TEMPERATURE (DEG. C)

SCSP 7 XX D SEA SURFACE CURRENT SPEED (METRES/SECOND)

SCDT 7 XX D SEA SURFACE CURRENT DIRECTION (DEGREES - TRUE NORTH)
Direction to which the sea surface current is flowing
(N.B. opposite convention to wind direction)

DEPH 7 XX N SENSOR DEPTH BELOW SEA SURFACE (METRES) downwards +ve

TEMP 7 XX D SEA TEMPERATURE (DEG. C)

PSAL 7 XX D PRACTICAL SALINITY (-)

HCSP 7 XX D HORIZONTAL CURRENT SPEED (METRES/SECOND)

HCDT 7 XX D HORIZONTAL CURRENT DIRECTION (DEGREES - TRUE NORTH)
Direction to which the current is flowing

PPPP K MM S

FFFF 7 GG N QUALITY CONTROL FLAG

This parameter is a quality control flag applicable to the value of the immediately preceding parameter in the 'user-defined area'. It is a single character flag coded as in the IGOSS system for quality control of operational data thus:

0 *No quality control (QC) has been performed on the value*

1 *QC performed: value appears correct*

2 *QC performed: value appears inconsistent with other values*

3 *QC performed: value appears doubtful*

4 *QC performed: value appears erroneous*

5 *Value has been changed as a result of QC*

6-8 *Reserved for future use*

9 *Value of the parameter is missing*

GCQF 7 GG N QUALITY CONTROL FLAGS FOR DATE, TIME, POSITION AND SEA FLOOR DEPTH

Contains a sequence of six single character quality control flags associated respectively with the values of: day (c8-9), month (c6-7), time (c10-13), latitude (c30-36), longitude (c37-44) and sea floor depth (c48-53) in that order, as recorded in card 4 of the series header record. Each flag is coded as in the IGOSS system for quality control of operational data - see code table associated with parameter code 'FFFF7GGN' above

GGMS 7 GG N IGOSS MESSAGE IDENTIFIER

Four character code to identify the type of message used to report the data thus:

JJXX - data reported in BATHY radio message

KKXX - data reported in TESAC radio message

PPPP K MM S

GGIN 7 GG N IGOSS BATHY/TESAC INDICATORS

A twenty character string of single digit flags set according to indicators reported in IGOSS BATHY/TESAC message thus:

*Char. 1: IGOSS WIND SPEED INDICATOR - i_u indicates the units in which wind speed was originally reported and the type of instrumentation used

Table 1853 of WMO Manual on Codes (WMO - No.306)

Code

0 m/sec
1 knots
} *certified instruments*

2 m/sec
3 knots
} *uncertified instruments*

N.B. Code does not necessarily relate to the units in which wind speed is subsequently stored

*Char. 2: PROBE HIT BOTTOM INDICATOR indicates whether depth profiling data was terminated by probe hitting the sea floor - coded as follows:

Code

0 unspecified, or probe did not hit sea floor

1 probe hit sea floor

*Char. 3: INDICATOR FOR DIGITIZATION - k_1 indicates method of digitizing temperature and/or salinity profiles

Table 2262 of WMO Manual on Codes (WMO - No.306)

Code

7 values at selected depths (data points fixed by instrument or selected by any other method)

8 values at significant depths (data points taken from traces at significant depths)

*Char. 4: METHOD OF SALINITY/DEPTH MEASUREMENT - k_2

Table 2263 of WMO Manual on Codes (WMO - No.306)

Code

0 No salinity measured

1 In situ sensor, accuracy better than 0.02

2 In situ sensor, accuracy less than 0.02

3 Sample analysis

*Char. 5: DURATION AND TIME OF CURRENT MEASUREMENT (VECTOR OR DOPPLER CURRENT PROFILING METHOD - k_3

Table 2264 of WMO Manual on Codes (WMO - No.306)

Code		
1	*Instantaneous*	*Between H-1 and H*
2	*Averaged over 3 minutes or less*	
3	*Averaged over more than 3 minutes, but 6 at the most*	
4	*Averaged over more than 6 minutes, but 12 at the most*	
5	*Instantaneous*	*Between H-2 and H-1*
6	*Averaged over 3 minutes or less*	
7	*Averaged over more than 3 minutes, but 6 at the most*	
8	*Averaged over more than 6 minutes, but 12 at the most*	
9	*Vector or Doppler current profiling method not used*	

Note: *H* = Time of observation. When Doppler current profiling method is used, codes 1 through 4 are used

*Char. 6: PERIOD OF CURRENT MEASUREMENT (DRIFT METHOD) - k_4

Table 2265 of WMO Manual on Codes (WMO - No.306)

Code	
1	*1 hour or less*
2	*More than 1 hour but 2 at the most*
3	*More than 2 hours but 4 at the most*
4	*More than 4 hours but 8 at the most*
5	*More than 8 hours but 12 at the most*
6	*More than 12 hours but 18 at the most*
7	*More than 18 hours but 24 at the most*
9	*Drift method not used*

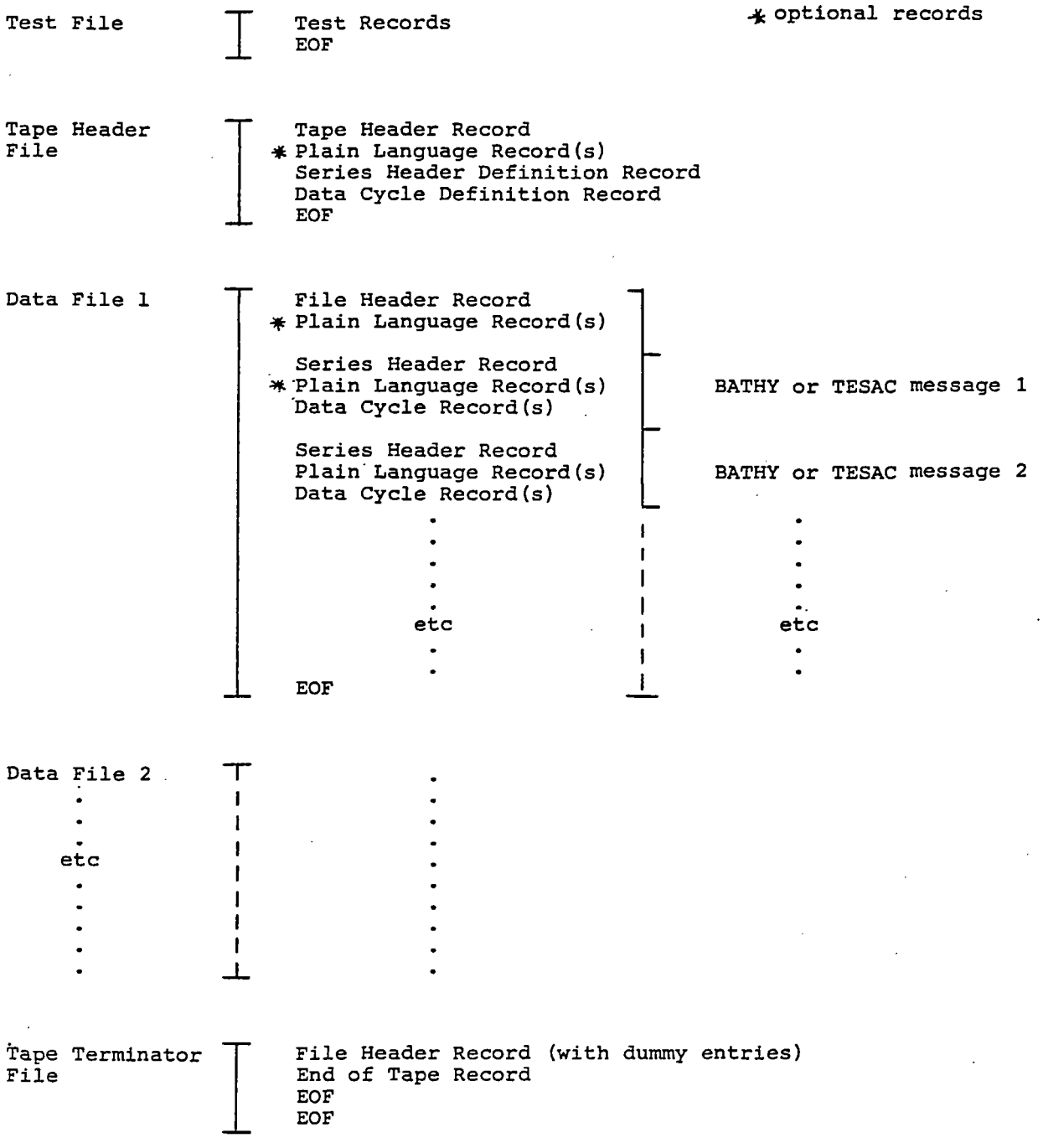
*Char. 7: INDICATOR FOR METHOD OF CURRENT MEASUREMENT - k_5

Table 2266 of WMO Manual on Codes (WMO - No.306)

Code	
2	*GEK (Geomagnetic Electrokinetograph)*
3	*Ship's set and drift determined by fixes 3-6 hours apart*
4	*Ship's set and drift determined by fixes more than 6 hours but less than 12 hours apart*

*Chars. 8-20: RESERVED FOR FUTURE USE - blank filled

4. TAPE STRUCTURE



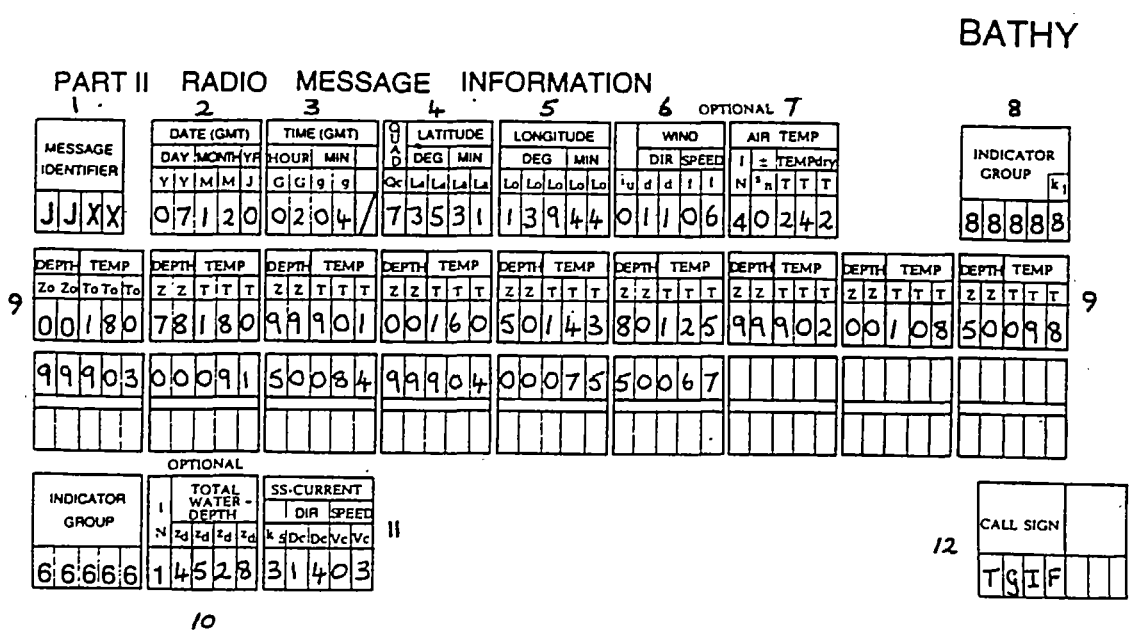
5. DEFINITION RECORDS

5.1 Series Header Definition Record

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

34 13  OP        (4A1,6A1,10X,I3,1X,A1,1X,I2,1X,A1,5X,I4,1X,A1,5X,I2,1X,A1,   001
3                1X,I2,1X,A1,5X,20A1,144OX)                                    002
3                                                                              003
3 GGMS7GGN   IGOSS MESSAGE IDENTIFIER   A   4                                 004
3 GGQF7GGN   QUAL FLG D,M,T,LAT,LON,SNDGA   6                                 005
3 WSPD7XXA   WIND SPEED (M/SEC)         I   3 93     0.1      0.0             006
3 FFFF7GGN   QUAL FLAG FOR WIND SPEED   A   1                                 007
3 WDIR7XXA   WIND DIRECTION (DEG TRUE)  I   2 92    10.0      0.0             008
3 FFFF7GGN   QUAL FLAG FOR WIND DIRECTN A   1                                 009
3 DRYT7XXA   AIR TEMPERATURE (DEG C)    I   4 94     0.1      0.0             010
3 FFFF7GGN   QUAL FLAG FOR AIR TEMP     A   1                                 011
3 SCSP7XXD   SS-CURRENT SPEED (M/SEC)   I   2 92 0.05144      0.0             012
3 FFFF7GGN   QUAL FLAG FOR SS-CUR SPEED A   1                                 013
3 SCDT7XXD   SS-CURRENT DIR (DEG TRUE)  I   2 92    10.0      0.0             014
3 FFFF7GGN   QUAL FLAG FOR SS-CUR DRCTN A   1                                 015
3 GGIN7GGN   IGOSS BATHY/TESAC INDICATRSA  20                                 016
3                                                                              017
3                                                                              018
3                                                                              019
3                                                                              020
3                                                                              021
3                                                                              022
3                                                                              023
3                                                                              024
```

5.2 Data Cycle Definition Record

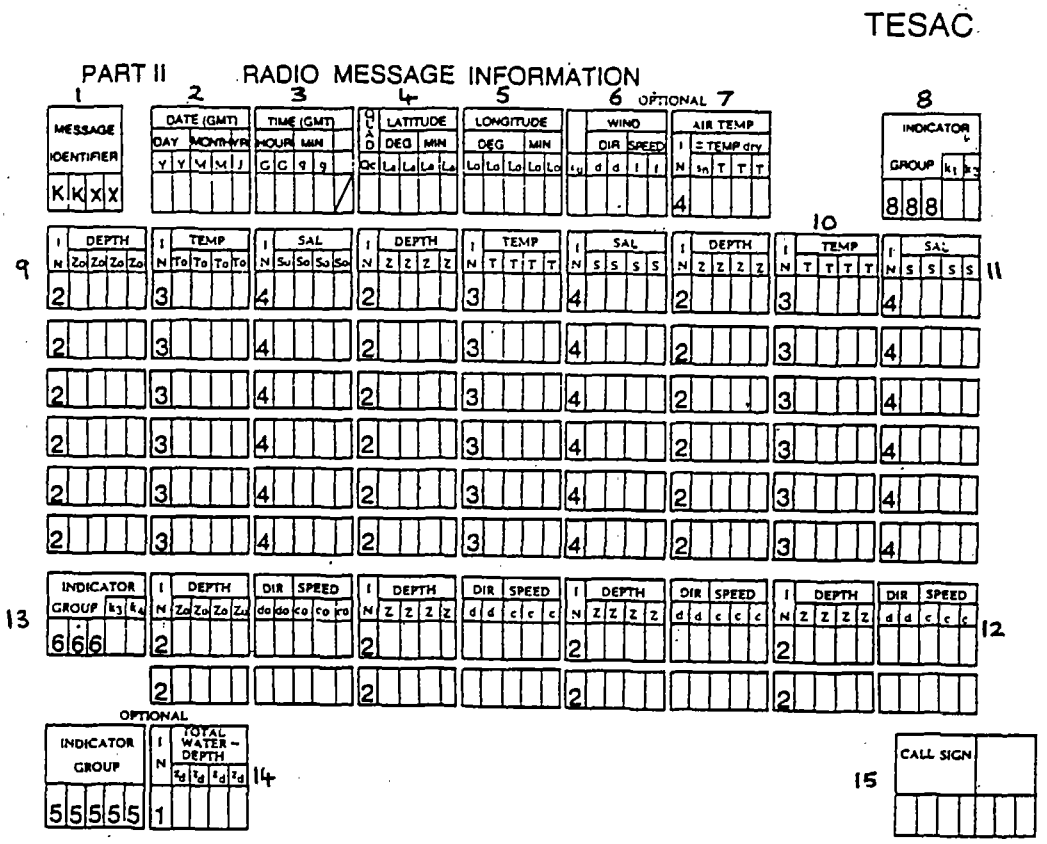
```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

45  0 10P        (60X,46(5X,I4,1X,A1,2X,I4,1X,A1,2X,I4,1X,A1,2X,I3,1X,A1,2X,  001
4                I2,1X,A1))                                                    002
4                                                                              003
4 DEPH7XXN   SENSOR DEPTH (METRES)      I   4        1.0      0.0             004
4 FFFF7GGN   QUAL FLAG FOR DEPTH        A   1                                 005
4 TEMP7XXD   SEA TEMPERATURE (DEG C)    I   4 94    0.01      0.0             006
4 FFFF7GGN   QUAL FLAG FOR SEA TEMP     A   1                                 007
4 PSAL7XXD   PRACTICAL SALINITY         I   4 94    0.01      0.0             008
4 FFFF7GGN   QUAL FLAG FOR PRAC SALIN   A   1                                 009
4 HCSP7XXD   HORZ CURRENT SPEED (M/SEC) I   3 93    0.01      0.0             010
4 FFFF7GGN   QUAL FLAG FOR CURR SPEED   A   1                                 011
4 HCDT7XXD   HORZ CURRENT DIRECT(DEG TR)I   2 92    10.0      0.0             012
4 FFFF7GGN   QUAL FLAG FOR CURR DIRECTN A   1                                 013
4                                                                              014
4                                                                              015
4                                                                              016
4                                                                              017
4                                                                              018
4                                                                              019
4                                                                              020
4                                                                              021
4                                                                              022
4                                                                              023
4                                                                              024
```



Field No.	Field Name	Mapping to GF-3
1	message identifier	maps to the parameter 'IGOSS MESSAGE IDENTIFIER' in the series header record
2,3	date/time	maps to card sequence 004 of the series header record in columns 2-13 (start date/time)
4,5	latitude, longitude	maps to card sequence 004 of the series header record in columns 30-44 (fixed latitude and longitude)
6	wind speed and direction	maps to the parameters 'WIND SPEED' and 'WIND DIRECTION' in the series header record - wind speed converted to metres/second if necessary. The indicator i_u is mapped to the first character in the parameter 'IGOSS BATHY/TESAC INDICATORS' in the series header record
7	air temperature	maps to the parameter 'AIR TEMPERATURE' in the series header record
8	8888k_1	k_1 maps to the third character in the parameter 'IGOSS BATHY/TESAC INDICATORS' in the series header record
9	depth, temperature	maps to the parameters 'SENSOR DEPTH' and 'SEA TEMPERATURE' in the appropriate data cycle of the data cycle record
10	total water depth	maps to card sequence 004 of the series header record in columns 48-52 (sea floor depth). Omitted when group 00000 (instrument hits the bottom) is used in which case the second character in the parameter 'IGOSS BATHY/TESAC INDICATORS' in the series header record is set to '1'
11	sea surface current speed and direction	maps to the parameters 'SS-CURRENT SPEED' and 'SS-CURRENT DIRECTION' in the series header record. The indicator 'k_5' is mapped to the seventh character in the parameter 'IGOSS BATHY/ TESAC INDICATORS' in the series header record.
12	call sign	maps to card sequence 002 of the series header record in columns 13-19 (specific platform code)

See section 7 for an annotated listing of the above sample BATHY message in GF-3

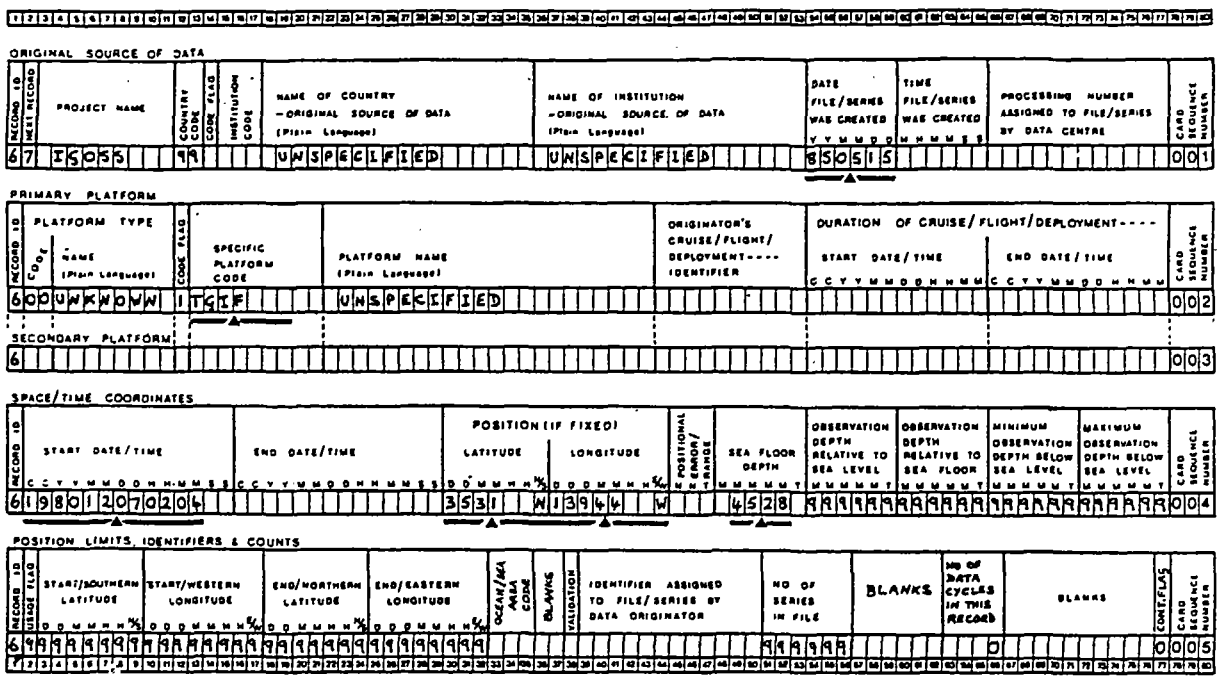
6.2 MAPPING THE TESAC RADIO MESSAGE TO GF-3



Field No.	Field Name	Mapping to GF-3
1-7		mapping as for fields 1 to 7 of the BATHY message
8	$888k_1k_2$	k_1 maps to the third character and k_2 to the fourth character of the parameter 'IGOSS BATHY/ TESAC INDICATORS' in the series header record
9-12	depth level data	map to the parameters 'SENSOR DEPTH', 'SEA TEMPERATURE', 'PRACTICAL SALINITY', 'HORZ. CURRENT SPEED', and 'HORZ. CURRENT DIRECTION' in the appropriate data cycle of the data cycle record
13	$666k_3k_4$	k_3 maps to the fifth character and k_4 to the sixth character of the parameter 'IGOSS BATHY/ TESAC INDICATORS' in the series header record
14	total water depth	mapping as for field 10 of the BATHY message
15	call sign	mapping as for field 12 of the BATHY message

7.1 ANNOTATED LISTING OF SAMPLE SERIES HEADER RECORD FROM A BATHY MESSAGE - FORMATTED ACCORDING TO THE DEFINITION GIVEN IN 5.1

FIXED FORMAT PART OF RECORD



JJXX 111111 60 1 11 1 242 1 3 1 14 1 0080993
* * * * *

Wind speed (6.0 m/s)

Wind direction (110°)

Air temp. (24.2°C)

IGOSS BATHY/ TESAC indicators

QC flags for date, time, position and sounding depth - all values appear correct

S-S current speed (0.154 m/s)

S-S current direction (140°)

Message identifier
JJXX = BATHY

*=QC flag for preceding parameter value
(1=value appears correct)

USER FORMATTED AREA OF RECORD (SEE 5.1)

1 2 3 4 5 6 7 8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

NOTE: Only the —▲— fields can be filled from a BATHY or TESAC message - the remaining fields are set by default as given above

7.2 ANNOTATED LISTING OF SAMPLE DATA CYCLE RECORD FROM A BATHY MESSAGE-FORMATTED ACCORDING TO THE DEFINITION GIVEN IN 5.2