

A Geological and Geophysical data Collection System

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Abstract

A geological and geophysical data collection system using a Personal Computer is described below. The system stores data obtained from various survey systems typically installed in a charter vessel and can be used for similar applications on any other ship. It uses a single board computer to collect data from a deep sea echosounder and a marine magnetometer. Typically data can be stored for 35-45 days research cruises

Description

Survey Ships are deployed for sample and data collection on nodules in Indian Ocean. They are usually installed with a Satellite Navigator, Deep sea echosounder and Marine Magnetometer. Optionally some analytical and survey instruments are also deployed depending on the objectives of the cruise. Also available onboard are a variety of sampling devices such as Peterson Grab, Bucket dredges, Corers etc. Considerable data is generated during a cruise which needs storage and subsequent analysis. Keeping this in view it was decided to use a personal computer [1] for logging the data. The data logging systems available are mostly supporting magnetic tape as storage device. Easy handling and processing can be done with the floppy storage system. This work is custom built to suit the requirements of oceanography field data storage. A brief description of the main survey instruments is given here.

Satellite Navigator MX 1107RS

The system comprises of 150/400 MHz antenna/preamplifier, receiver terminal with display and keyboard, a remote display unit [2]. It interfaces with the ships Gyro and speed log for the determination of dead reckoned position. The position information is made available on the display and at a remote location.

Deep Sea Echosounder

A 3.5/12 kHz Raytheon echosounding system comprising of a high power transmitter/receiver, correlation echo processor and line scan recorder provides the depth [3]. It is presented on a chart as a line scan record and is also available in digital format.

Marine Proton Precession Magnetometer

Total magnetic intensity of the earth at a point is measured by a toroidal sensor towed behind the ship and is presented to the user as analog record and digital form for further processing [4].

Discussion

Hardware

The block diagram in Fig. 1 shows the system configuration [5], [6]. The IBM personal computer serial communication

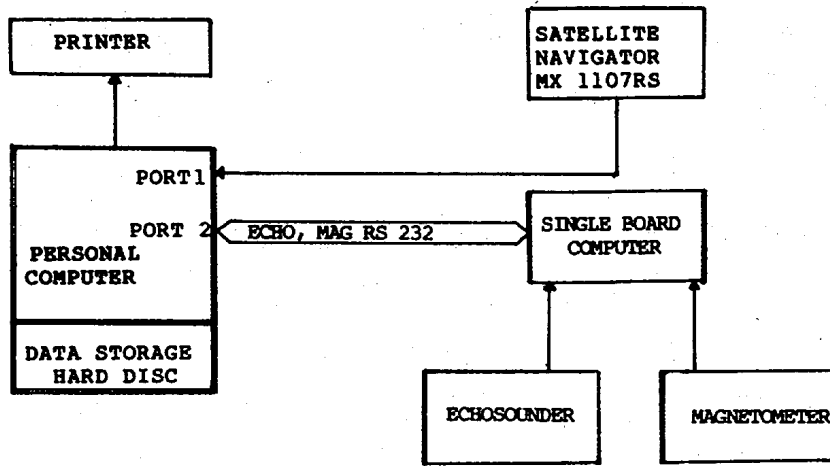


Fig.1: System Configuration

port COM 1 is directly connected to the Satellite navigator printer port. The second port COM 2 is allocated to the Single Board Computer (SBC). Both the instruments are set up to communicate in RS 232C format. A standard NLQ 132 column printer is connected to the PC printer port. This facilitates hardcopies of the data records obtained by the entire system. The SBC has two parallel port. A powerful system manager allows easy use of the SBC. Sufficient memory (256K) is provided with a battery backup. The program to access data from magnetometer and Echosounder is resident to the battery backup memory.

Software

The package consists of two parts [7] as illustrated in Fig. 2a. It shows the logical flow diagram for the software routine. The PC routine is written in BASIC. The SBC routine is written in assembly language and the logical flow is shown in Fig. 2b.

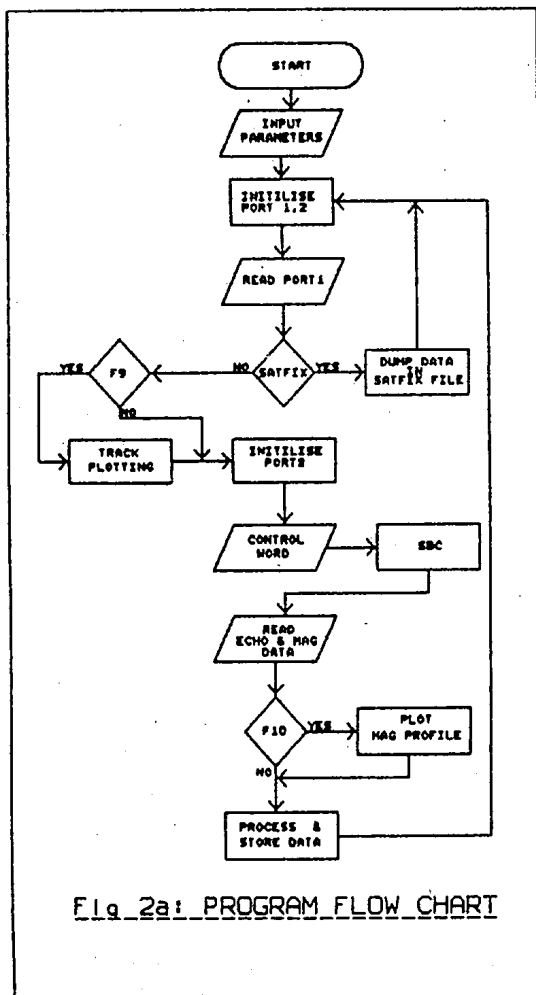


Fig. 2a: PROGRAM FLOW CHART

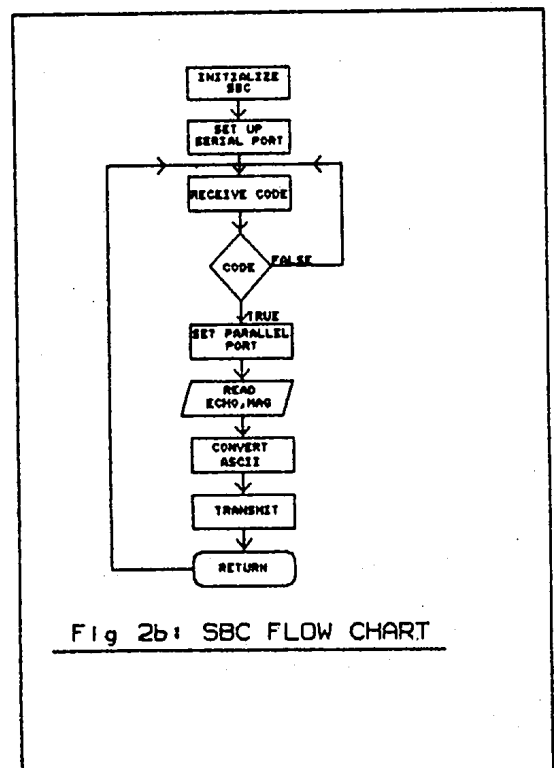


Fig 2b: SBC FLOW CHART

The software when executed will ask a series of inputs to the operator/user. These include

- a) Line Identification
- b) Event Number (Default 10000)
- c) Data File Name
- d) Echosounder/Magnetometer (Yes/No)
- e) Print (Yes/No)
- f) Satfix File Name

The user responds with appropriate inputs to begin the data acquisition. The programme initializes the serial port 1 and the communication protocol (600 Baud, 8 data bits, no parity, 2 stop bits). Satnav outputs the position information in timed format. Once first position data is received by the PC, a code character is transmitted to the SBC. The SBC after correct code reception reads the latest digital data from the instruments. This is then converted to ASCII format and transmitted to the PC. The PC appends this data to the position information to form a full record, displays on the screen after elimination of all unnecessary information and enters the next loop to obtain another record. When the buffer allocated to the records is full it is transferred on the hard disk. A full record consists of event number, position data, echosounder and magnetometer data. The software automatically updates the file name every 24 hours, that is, at 00.00 GMT.

Considerable data compression is achieved by filtering out blanks and other nonessential characters from each record. This allows more data to be recorded in a file and consequently on the hard disk. The data can be copied on floppy diskettes and taken out for post processing.

Another special feature of the software is, it offers function switch selectable view of cruise track and magnetic values against latitude. This is achieved through the enabling of F9 and F10 keys. When F9 is pressed it paints cruise track on the screen for 50 position record. Upon selection of F10 the last ten magnetic values are plotted on the screen. The display also shows the latest record of position, depth, magnetic data along with the event number below the screen. The printer option allows user to select his own timed printouts.

Merits

- * Collection of position, echosounding, Magnetic data without continuous presence of an operator.
- * IBM PC compatible data files allow users, the choice of all PC compatible software packages for post processing.
- * Highly filtered and compressed data recording enabling single 40MB hard disk storage for a cruise. Each day data copied automatically under a separate file name.

Conclusions

The system was assembled in the lab with Satnav and Magnetometer connected. The setup was continuously operated for more than a day. No problems were anticipated and none were encountered. Further improvements can include the interface to a Gravimeter. Other instruments can also be attached but would need increased hardware. Also the SBC can be replaced by PC compatible I/O card.

Acknowledgements

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References

- [1] Desai R. G. P., D'sa E. J., D'sa and Afzulpurkar S. A Geological data logger, IEEE OE - 11, Vol. 3, 1987, pp 428 - 431.
- [2] Magnavox Mx 1107 Satellite Navigator service manual
- [3] Raytheon echosounding system handbook
- [4] EGG & G Geometric Marine proton precession magnetometer manual
- [5] Programmer's guide to the IBM PC
- [6] Microfriend ILC V2, User manual, Dynalog Micro Systems
- [7] GW Basic user manual.