

**ON-LINE DATA ACQUISITION SYSTEM FOR AANDERAA WEATHER STATION**

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**ABSTRACT**

*Aanderaa Weather Station can be installed at unattended remote places for collection of various weather parameters at regular preselected intervals. The weather parameters are recorded on the magnetic spool inside a battery operated datalogger which is housed in an aluminium box, placed on the ground level. As the recording station is supposed to operate unattended for a long duration of time, a need arose to check quality of data periodically. Hence a datalogger was interfaced to a microcomputer. This paper describes the scheme adopted to compute the weather parameters instantaneously which can be displayed or printed, or stored on the data cartridge at user's wish.*

**INTRODUCTION**

NIO, Goa has been using an Aanderaa Weather Station 2700 for the past six years and has measured parameters like air temperature, wind speed, wind direction, relative humidity, solar radiation, air pressure at various places along the coasts of India. Observations from such station are usually more precise than manual observations and often at less cost. Data can be recorded at the unattended station on Data Logger DL-1. Weather station (Fig.1) consists of a) a hardware setup for carrying the sensors, a sensor plug-in board, cables and connectors b) provision for fitting 11 sensors c) data logger DL-1 for storing sensor data.

Weather proof data logger DL-1 works on 9 volts non-magnetic battery. Analog signals from 12 different channels are converted to digital data and stored on 1/4 inch magnetic spool. The first channel is reserved for the instrument's reference number and the remaining 11 channels for the measured data. The datalogger is triggered at preset intervals by a built in quartz clock. The interval selection can be made 1, 2, 5, 10, 15, 30, 60, or 180 minutes. The longterm data collection shows that 60 minutes interval is suitable for recording as there is not much changes observed in every 60 minutes. The storage capacity of the spool is 5000 records of each 12 channels.

Normal procedure to read the data on magnetic spool is to run it in laboratory on Aanderaa Tape Reader 2650 interfaced to microcomputer. However for instantaneous checking of quality of data getting recorded at field station, a need arose to interface the datalogger to a microcomputer. This system is developed at NIO and discussed in the present paper.

**METHOD**

During the installation of Weather Station, it is necessary to note down the sensors fixed in each channel. The data records channel 1 to 12 sequentially and the same is sent via output plug. This sequential order of data determines the sensor type.

The output pulses in Aanderaa format available on

connector board No.2803 can be obtained by plugging an output receptacle mating Aanderaa plug 2828. The pulses are generated by the rotary encoder in the datalogger during the measuring process and consists of 10 short and long pulses called a word for each channel. A set of 12 words makes one record, it is possible to tap each word as it comes through the inverter and microprocessor board interfaced to HP 85 B microcomputer.

Schematic representation of on-line data acquisition system is shown in Fig.2. The electrical signal available at the mating Aanderaa plug has a 5V negative binary logic and to make it compatible to SID (Serial Input Data) line of microprocessor 8085, an operational amplifier is used as the inverter.

On the microprocessor board, the software is developed in an assembly language so as to monitor the output of DL-1 and identify 10 bit word. The short and long pulses will be identified as ONE and ZERO depending upon pulse duration of 30 msec. or 90 msec. The 10 bit word is split into two bytes and is available at CRT port in RS 232C format at 150 baud rate. The flow chart for output of this data from microprocessor board is shown in Fig.3. The 10 bit word recorded on magnetic tape is called as 'N' value. The various sensor parameters are computed using the following equation in which the various sensor constants are calibrated and provided by M/s. Aanderaa Instruments.

$$S = (A + a) + (B + b) * N + C * N * N + D * N * N * N$$

Where, A, a, B, b, C, D, are individual sensor constants.

The serial interface 82939A board is plugged into one of the ports of HP 85B and its mating connector is connected to CRT port of microprocessor board. Through the control statements written in BASIC, this port will wait till two bytes of information comes from microprocessor board. After identifying these two bytes and computing the 10 bit data word the program calculates the actual parameter value using the above equation, and corresponding sensor constants. Flow chart in Fig.4 explains the logic used for computation of sensor parameters. Depending upon the

necessity, these values can be printed or stored on the cartridge. After computing one parameter value, the PC will start searching for the incoming information from the microprocessor board. The gap between successive words sent by datalogger is 4 seconds. When next two bytes arrive the system will compute the next sensor parameter as described above. The computer serial port always waits for the information from the microprocessor board.

## RESULTS AND DISCUSSIONS

The on-line weather data acquisition system is used at the west coast of India. The printout parameters on HP 85B were compared with the parameters obtained by reading the recorded magnetic spools on Aanderaa tape reader 2650 interfaced to IBM PC. The results were within the range of 0.1%. Due to adverse conditions like humid, high temperature, salt spray and dusty weather, the datalogger may start malfunctioning or sensors may damage with time which will lead to data loss. By using this system the loss of data can be minimised as it gives actual parameter values from time to time and in the event of malfunctioning of the weather station one can attend to its repairs. As this system needs 230V power supply, a portable uninterrupted power supply is necessary to use at remote places. However this system can be used on offshore platforms, ships where the on-line data is necessary and will also find use in weather forecasting and climatology.

## ACKNOWLEDGEMENT

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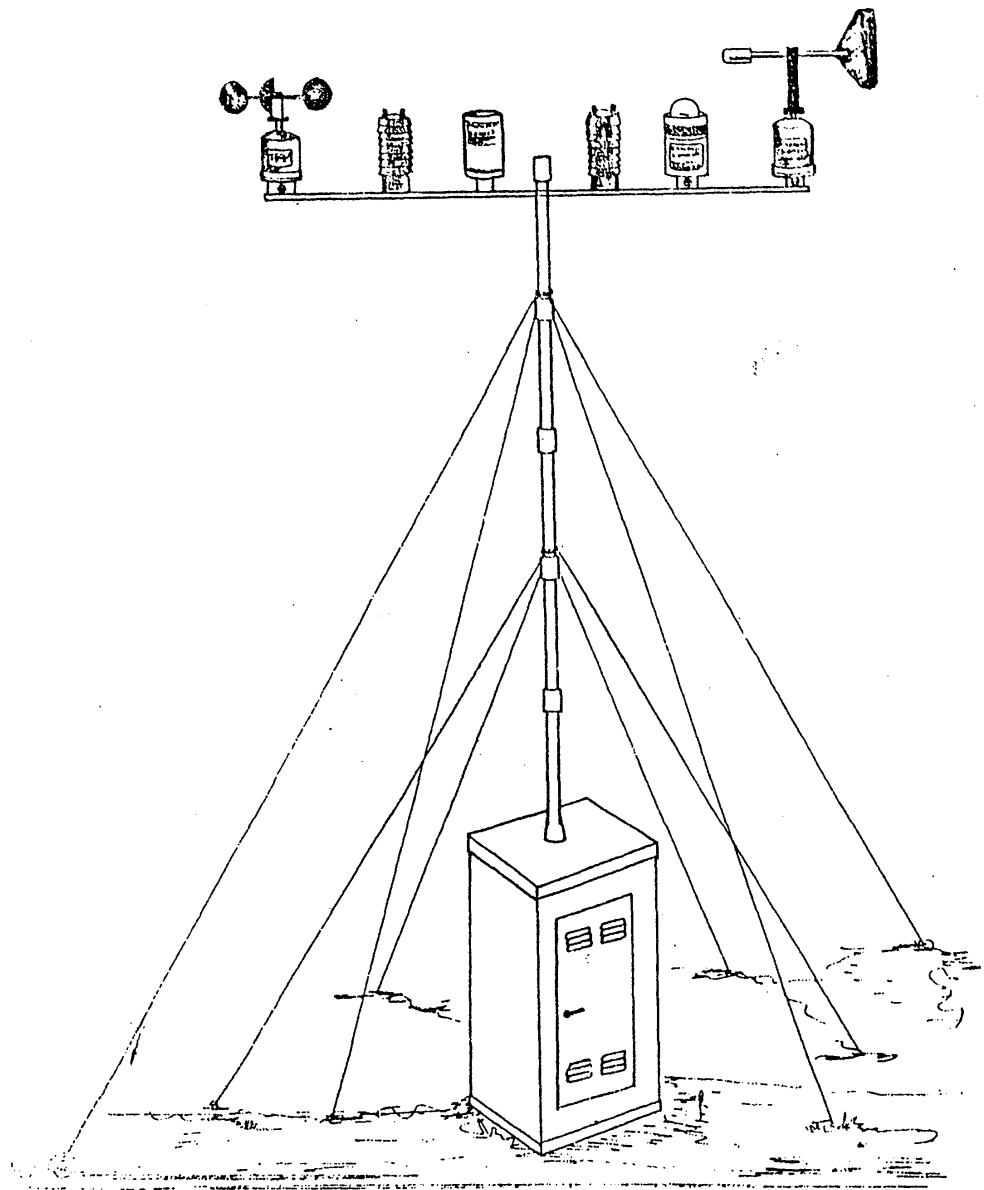


Fig. 1 Aanderaa weather station.

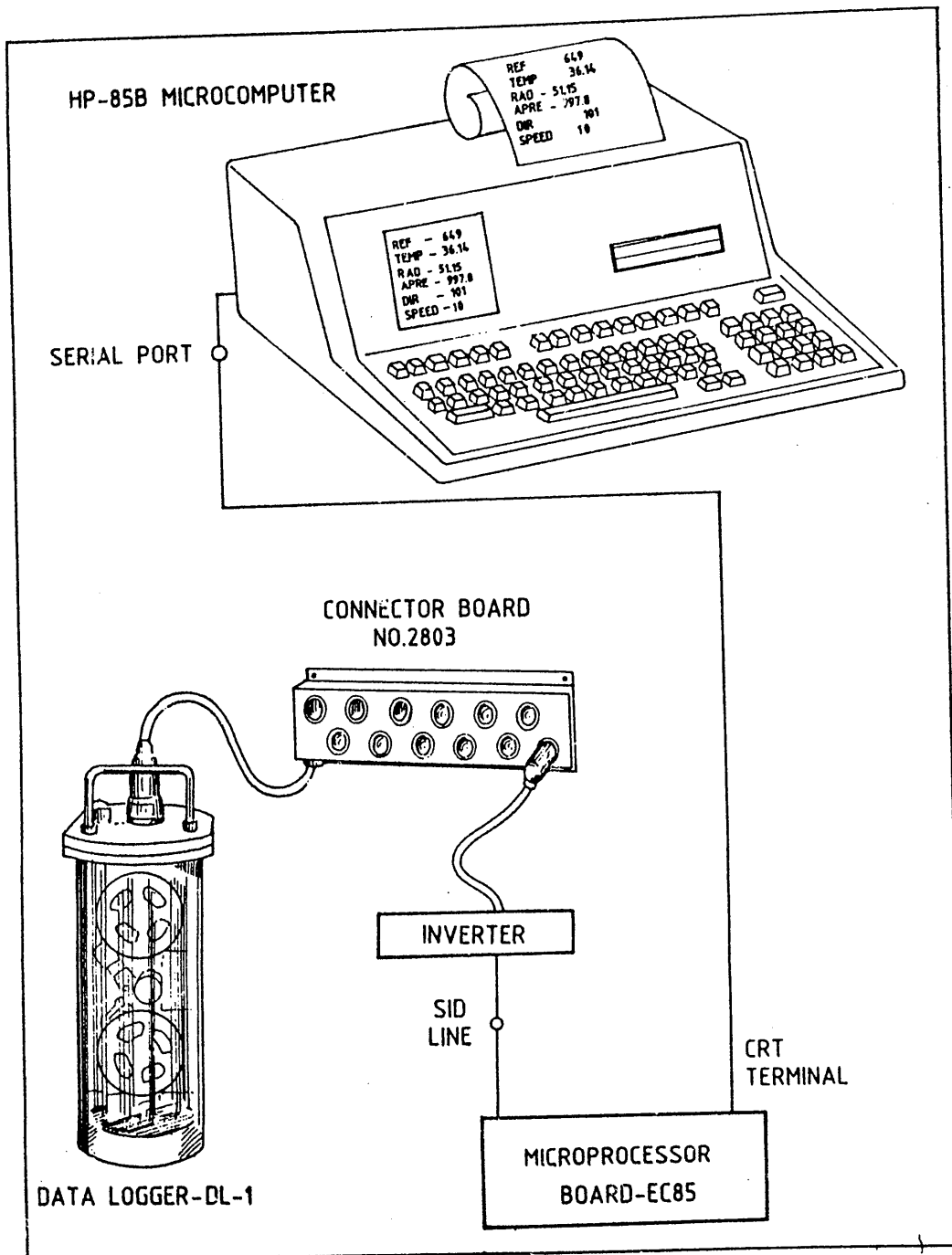


Fig. 2. Schematic representation of on-line data acquisition system

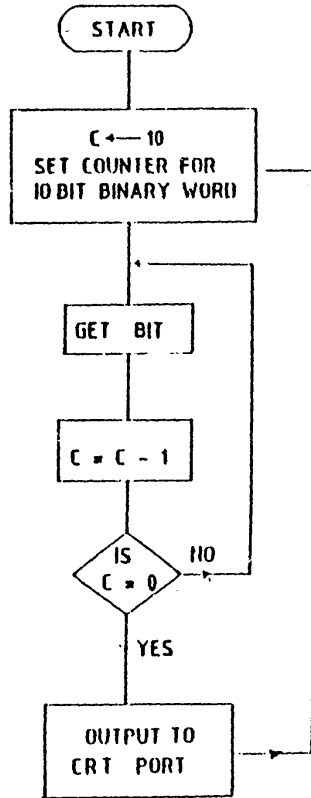


Fig. 3 Flow chart for micro-processor board output.

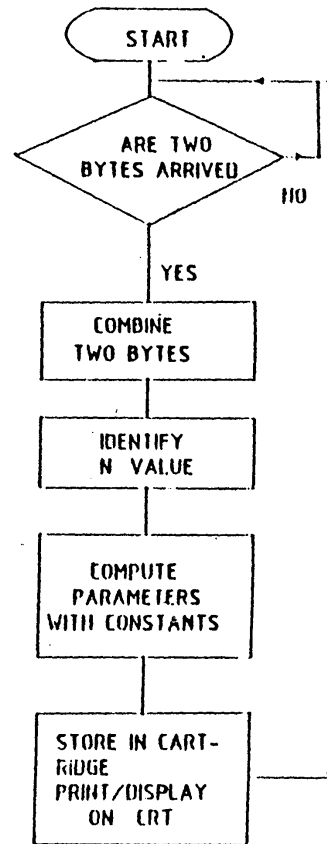


Fig. 4 Flow chart for coputation of weather parameters.