

**COMPARASION OF DIGITAL AUTOMATIC RECORDING SYSTEM  
DATA WITH AUTOGRAPHIC CHARTS RECORDER DATA AT INDIA  
METEOROLOGICAL DEPARTMENT'S CONVENTIONAL  
OBSERVATORY**

***Anjit Anjan, Dr. R.D.Vashistha,P.S.Biju\* & Rudra Pratap***

O/o Dy. Director General of Meteorology (Surface Instruments),  
India Meteorological Department, Shivaji Nagar,  
Pune-411 005 INDIA  
Telephone: +91-20-25535411, Telefax: +91-20-25521529  
E-mail: [anjit\\_anjan@yahoo.com](mailto:anjit_anjan@yahoo.com)

\*O/o Meteorological Centre, India Meteorological Department,  
Thirunanthapuram, Kerela (India)

**Abstract**

India Meteorological Department (IMD) has specially designed Digital Automatic Recording System (DARS) for continuous measurement of meteorological parameters in numerical format and graphical format. This system stores data and also view data of Temperature, Relative Humidity, Station level Pressure, Wind Speed and Wind direction and rainfall in numerical format and also graphical format. The data may be stored up to five years and may be downloaded as per user requirement. The main purpose for development of this system is a step towards automation of Conventional Observatory. This system will replace the conventional autographic charts such as Thermograph, Barograph and Hairograph. This new indigenously developed system does not require daily maintenance as compared with conventional, mechanical autographic charts.

Thermograph, Barographs and Hygrographs use mechanical means for its measurement. The main disadvantage of autographic charts, it requires daily

maintenance such as changing daily charts at 0300 UTC, properly ink filling and also requires maintenance of clock drum. A tabulation sheet from daily charts has to be prepared.

IMD has installed DARS at CAGMO, Pune, Meteorological Centre, Trivandrum and Regional Meteorological Centre, Nagpur. The data of DARS with autographic charts recorder at conventional observatory have been compared and found satisfactory. The performances of DARS in IMD observatory are very encouraging since their installation. IMD is planning to install DARS at Antarctica and also to IMD's 199 conventional observatory.

Key words; IMD, DARS.

## **1. Introduction**

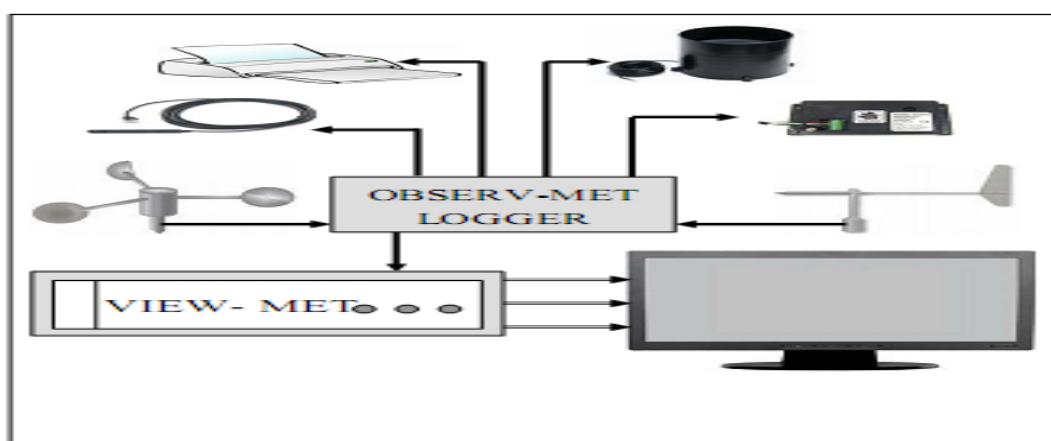
The Surface Instruments Division of India Meteorological Department was conceived and established at Pune after India became an independent country. The surface meteorological and upper air radiosonde instruments are manufactured at the Instruments Division. All surface meteorological instruments are manufactured at a well equipped and self sufficient workshop maintained by the division. All manufactured instruments are checked, tested and calibrated in the various laboratories. The laboratories also carry out research in instrumentation and bring out new designs in them. The Division maintains detail instruction manuals and engineering drawings on all instruments. The division maintains network of AWS, radiation observatories, Airport met. Instruments, Ozonesonde etc. These activities have contributed in India being designated as the Regional Training Center for instruments by the World Meteorological Organization. In view of new requirement, IMD Pune has initiated to develop a digital system to replace the Mechanical instruments. These mechanical require clock maintenance and charts.

## 2. Digital Automatic Recording System

The Digital Automatic recording system consists of three main parts-

1. Main Data Storage Equipment (Data logger)-OBSERMET
2. Serial to VGA Converter-VIEW MET
3. Graphical Display/TFT Touch Panel

The Datalogger has analog inputs, serial inputs & digital inputs for reading various Analog and Digital Sensors. The Datalogger continuously monitors all the inputs, converts the parameters to digital values and stores these values with the respect of real time. One minute average values are calculated from the 60 samples by taking every second sample. For wind, vector average is taken for one minute. Instantaneous values for graphical trend are also stored in the Datalogger with respect to real time. This data is transmitted over RS422 for displaying the data on a TFT Touch Panel. The maximum and minimum value for all meteorological parameters is being calculated for the day by comparing the values throughout the day. It has data retrieval facility - Data stored in the internal flash memory may be retrieved on an external USB Stick and then can be uploaded on a PC. Data can be printed in the graphical trend format similar to conventional Strip Chart recorder. Graphical trend printing can be automatic after predefined duration or be on manual command. Its block diagram is shown in Figure-1.



**Figure-1**

The data display is the TFT screen for DARS is shown in Figure-2



Figure-2

### 3. Autographic Charts Recorder

An Autographic chart recorder is an instrument used to record various processes through mechanical clock. These chart recorders record data on paper. The paper is passed under a pen and the pen is deflected in proportion to the signal. The result is a graph or chart of the data. Chart recorders are available in single or multichannel styles (single or multipen) and in various configurations. XY recorders accept two inputs and create a chart or graph of one input versus the other. They are commonly used to determine the relationship between the two inputs- Data and Time. Every Day charts have to be replaced with new charts at a Fixed Indian Standard Time. The ink of the pen has to be checked on regular basis so that no data may be missed. More Human intervenes is

required for maintenance of Autographic Charts recorder. The three separate strip charts recorder are available at IMD Observatory-Barograph for Pressure, Thermograph for temperature and Hairograph and for Relative Humidity.

#### **4. Testing and Field Trail of the Digital Automatic recording System System and data Analysis**

- First System was installed at AWS Lab. IMD Pashan,Pune in June,2009.
- Two more systems have been installed for field trail in October, 2009.

➤ CAGMO,IMD,PUNE

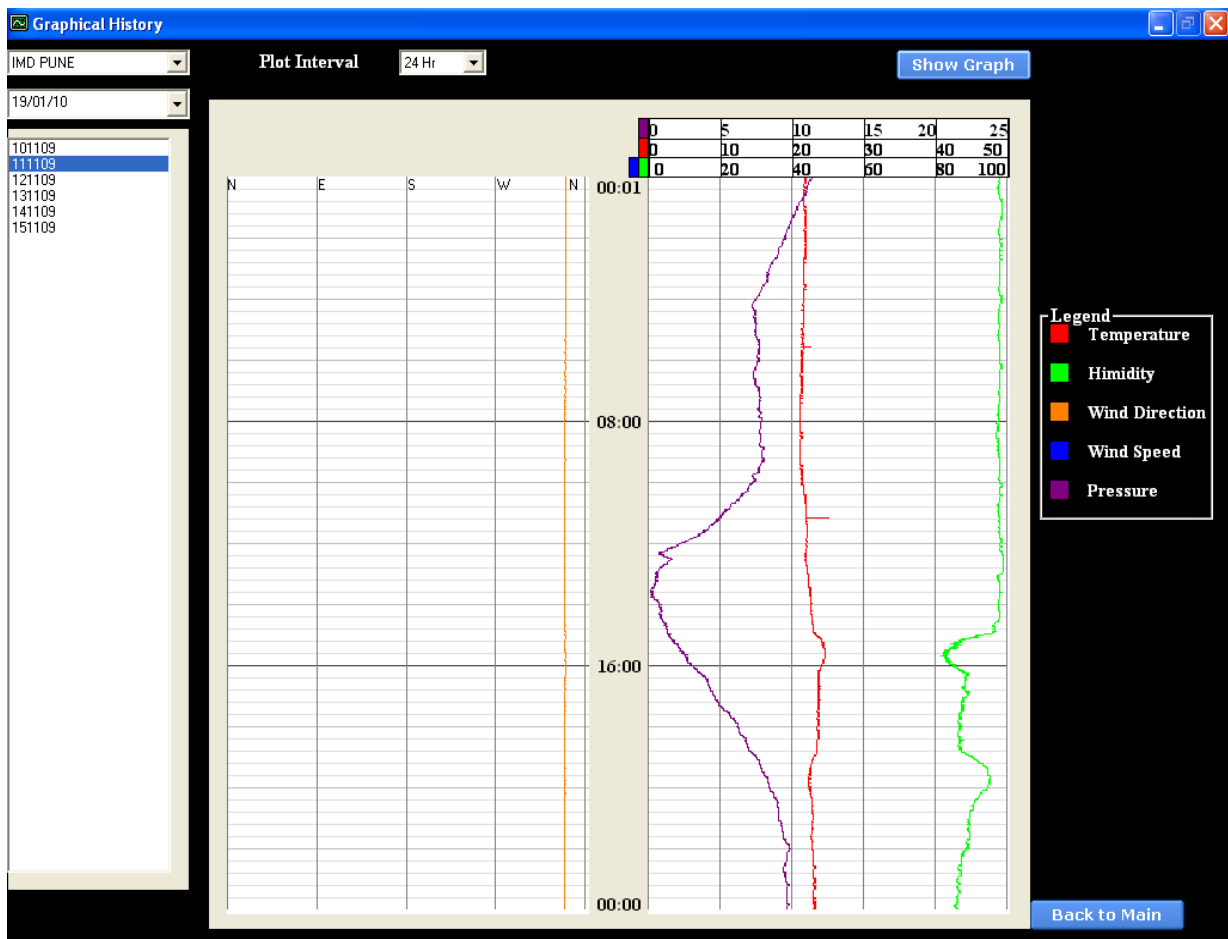
➤ RMC,NAGPUR

- One More system has been installed at for field trail in January, 2010.

➤ MC Trivandrum

- It have been working without any failure and data have been recorded at CAGMO,IMD,Pune and AWS Lab.,Pashan during recent PHYAN Cyclone in November,2009
- The data have been compared with Autographic Charts of CAGMO,IMD,Pune and found to be satisfactory.
- More System will be installed in RMCs and MCs for comparison with autographic charts under different weather conditions.
- Graphical Format may be seen in computer /Laptop as well as TFT screen.
- Some Graphical observations have been observed during 10th to 12th Novemeber, 2009 and shown in Figure 3.

- During **PHYAN Cyclone (11<sup>th</sup> Nov., 2009)**, Data of DARS have been recorded every minute and have been analyzed by seeing in the graph.
- Station Level Pressure Observed at **930.3 hPa at 13:45 IST on 11th November, 2009 in Digital Automatic Recording System** during PHYAN cyclone.
- Station Level Pressure Observed at **930.7 hPa (with correction factor -0.1 hPa) at 13:45 IST on 11th November, 2009 in Autographic Barograph charts** (Autographic charts) during PHYAN cyclone.



**Figure-3**

**Numerical format of Data stored in Digital Automatic  
Recording System during PHYAN Cyclone at  
CAGMO,Pune (11<sup>th</sup> Nov.,2009)**

| <b>Time (IST)</b> | <b>Air Temperature<br/>( ° C)</b> | <b>Relative<br/>Humidity<br/>(%)</b> | <b>Station level<br/>Pressure<br/>(hPa)</b> |
|-------------------|-----------------------------------|--------------------------------------|---|
| 13:01             | 22.4                              | 98.9                                 | 0930.6                                      |
| 13:02             | 22.5                              | 98.4                                 | 0930.7                                      |
| 13:03             | 22.5                              | 98.3                                 | 0930.7                                      |
| 13:04             | 22.5                              | 98.3                                 | 0930.7                                      |
| 13:05             | 22.5                              | 98.1                                 | 0930.6                                      |
| 13:06             | 22.6                              | 98.1                                 | 0930.6                                      |
| 13:07             | 22.5                              | 98.1                                 | 0930.5                                      |
| 13:08             | 22.6                              | 98.0                                 | 0930.6                                      |
| 13:09             | 22.6                              | 97.9                                 | 0930.6                                      |
| 13:10             | 22.6                              | 98.1                                 | 0930.5                                      |
| 13:11             | 22.6                              | 98.2                                 | 0930.5                                      |
| 13:12             | 22.6                              | 98.2                                 | 0930.6                                      |
| 13:13             | 22.6                              | 98.3                                 | 0930.6                                      |
| 13:14             | 22.5                              | 98.4                                 | 0930.6                                      |
| 13:15             | 22.5                              | 98.5                                 | 0930.6                                      |
| 13:16             | 22.6                              | 98.6                                 | 0930.6                                      |
| 13:17             | 22.5                              | 98.7                                 | 0930.5                                      |
| 13:18             | 22.5                              | 98.8                                 | 0930.5                                      |
| 13:19             | 22.5                              | 98.8                                 | 0930.5                                      |

## **5. Conclusions:**

The Digital Automatic Recording System is on field trail and tested in Meteorological Observatory of Pune and Comparisons of Charts recorder data with DARS data has been done. The data are comparable and useful for weather monitoring and forecasting, wind load climatology, adverse weather conditions. Hence, DARS as replacements for conventional autographic charts recorder as widely accepted by the user community. It is easy to install and maintenance and data is readily available in digital format.

## **Acknowledgements**

The authors are thankful to Dr. (AVM) Ajit Tyagi, Director General of Meteorology, India Meteorological Department, New Delhi for being an enduring source of encouragement and motivation. His day to day personal monitoring of the Digital Automatic recording system (DARS) and critical comments on the performance of Digital Automatic recording system.



## References:

- a. Manual of DARS ,IMD,2009
- b. Manual of Sutron AWS,Sutron Corporation ,USA,2006
- c. CIMO Guide (7<sup>th</sup> Edition)
- d. Manual of Jinayng ARG, Jinyang, Republic of Korea.
- e. Instruments and Observing Methods (report no.78):WMO
- f. Mc Culloch, J.S.G. and Strangeways, I.C., 1966, “Automatic Weather Stations for hydrology: Proc. WMO Tech. Conf. on Automatic Weather Stations, Geneva. Tech. Note No. 82, pp. 263-264.
- g. Hubbard, K.G. Rossenberg, N.J. and Neilsen, D.C., 1983, “Automated weather station network for agriculture”, J. Water Resource. Management, **109**, pp. 213-222
- h. Manual of Autographic Charts recorder,IMD,Pune,2008