Protocols for the Measurement of Atmospheric Pressure

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Prepared by:

Alberta Environment and Parks

2018

Web Site: http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/

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Comments, questions or suggestions regarding the content of this document may be directed to:

Jon Pedlar
Environmental Monitoring and Science Division
Alberta Environment and Parks
Deerfoot Square Building, Main Floor
2938 – 11 Street NE
Calgary, Alberta T2E 7L7
Phone: (403) 369-0050
Email: Jon.Pedlar@gov.ab.ca

Additional copies of this document may be obtained by contacting:

Information Centre
Alberta Environment and Parks
Main Floor, Oxbridge Place
9820 – 106 Street
Edmonton, Alberta T5K 2J6
Phone: (780) 427-2700
Fax: (780) 422-4086
Email: env.infocent@gov.ab.ca

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1.0 INTRODUCTION

The purpose of this document is to provide information regarding the methodology and technology to be used to measure atmospheric pressure. The goal is to ensure that data collected is accurate and consistent from station to station as well as conforming to World Meteorological Organization (WMO) standards as much as possible.

The nature and location of Alberta Environment and Parks (AEP) weather stations means that strict adherence to WMO standards is not always possible. In these cases, discrepancies should be noted and technicians will have to make decisions on how to best accommodate any issues.

No official formal standard operating procedure (SOP) for the measurement of atmospheric pressure has been written by the Government of Alberta. Most knowledge has been passed on through demonstration, collaboration, and mentorship. Guidance was gained from the WMO publication: Guide to Meteorological Instruments and Methods of Observation (2008 edition, updated 2010).

2.0 MEASUREMENT OF ATMOSPHERIC PRESSURE

2.1 Definition

The atmospheric pressure on a given surface is the force per unit area exerted by virtue of the weight of the atmosphere above. The pressure is thus equal to the weight of a vertical column of air above a horizontal projection of the surface extending to the outer limit of the atmosphere.

2.2 Units

The basic unit for atmospheric pressure measurement is the pascal (Pa). Other units, for example hectopascal (hPa) which is equal to 100 Pa in WMO standards, have been used as the preferred terminology. AEP reports atmospheric pressure in kilopascal (kPa). This is the preferred unit of the client using the data and follows Environment and Climate Change Canada's reporting of air pressure.

2.3 Sensor Specifications

WMO standards are as follows:

Measuring range: 500-1080 hPa (both station pressure and mean sea level pressure)

Required target uncertainty: 0.1 hPa

Reporting resolution: 0.1 hPa

Sensor time constant: 20 seconds

Output averaging time: 1 minute

The majority of modern electronic transducer based pressure sensors typically meet these specifications. However, manufacturer specifications need to be checked to confirm this standard.

2.4 Installation

The Forest Technology Systems (FTS) DigiBP barometric pressure sensor (Figure 1) consists of a barometric pressure transducer connected to a microcontroller unit that compensates for ambient temperature and communicates with the data collection platform using the Serial Digital Interface at 1200 baud (SDI-12) protocol. For best results, the sensor should be placed between 1.5 to 3 meters from the ground where it will be accessible for servicing. Barometers are affected by wind, and as a result, exposure to gusts and changes in wind direction will have an effect on the readings. The sensor should be placed in an enclosure with ample venting for protection from the elements as well as being equalized with the exterior air pressure. Be sure to check with the manufacturer for any equipment specific requirements.

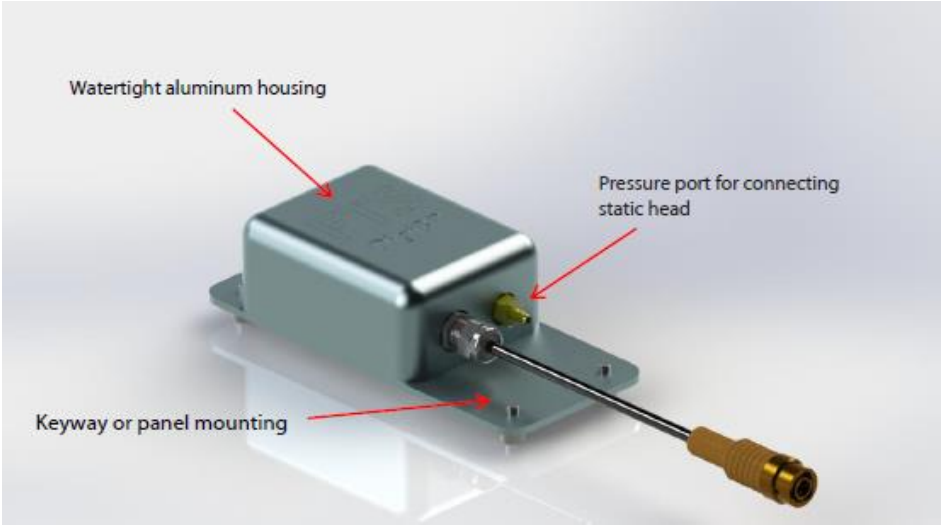

Figure 1. Photo of FTS DigiBP Barometric Pressure Sensor

2.5 Data Logging

Data will be logged as a 1 minute average on the last minute of the hour. The data will be sampled once every 5 seconds for a total of 12 measurements and then averaged and logged.

2.6 Field Checks and Calibrations

At the current time, field checks are done by comparing the data to the nearest Environment and Climate Change Canada weather station. There is only one barometric pressure sensor in the entire AEP network which is located at the Dickson Dam weather station. These data are compared to the information found on the Environment and Climate Change Canada website for Sundre.

Calibrations should be done according to the manufacturer's specifications.

3.0 ACKNOWLEDGEMENTS

The preparation of this document was made possible through the cooperation and efforts of Alberta Environment and Parks Environmental Monitoring and Science Division staff and staff of Alberta Agriculture and Forestry cooperating as the Meteorological Working Group.

4.0 REFERENCES

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- FTS (2017). *DigiBP SDI-12 Digital Barometric Pressure Sensor User Manual*. Document available upon request.