DaqPod

Operating Instructions

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DaqPod
Operating instructions:

The DaqPod is a hand held, battery powered, weather sensor device. It uses a trio of sensors to calculate Density Altitude and Air Density. These sensors are comprised of a pressure sensor for barometric pressure, temperature sensor and a relative humidity sensor. The DaqPod uses high performance sensors to obtain accurate readings and uses sophisticated digital filtering techniques to ensure stable high quality readings. With this device, you are using 21st century technology.

Operation:

The DaqPod is a polled serial peripheral device. You can connect the COM port on the DaqPod to a desktop computer and collect the data using the DaqPod Terminal Software. You can also use other programs to take readings from the DaqPod, such as HyperTerminal. **Set the serial link parameters in the program for 19200 baud, 8 data bits, no parity, and 1 stop bit**. The DaqPod is also easy to interface to third party or custom software. The interface commands are all single ASCII characters. All responses to the commands are formatted in ASCII, and can be requested as individual numbers or as traditional readings with unit descriptors attached.

Sensors:

- The Barometer (BP) is a 16 PSIA sensor, which has a linear output from 0.2Volts at complete vacuum to 4.7 Volts at 16PSIA (a little higher than the barometric pressure at sea level (14.7 PSIA)). The calibration "O" command will allow you to adjust the barometer to the local altitude so your barometric pressure readings will match that of the local news channel. To request a barometric pressure reading from DaqPod use the "**B**" command for barometric pressure numbers only, or the "**b**" command for barometric pressure with descriptors. Barometric pressure is available in English and Metric units.

- The next sensor, Air Temperature (AT), is a linear temperature sensor with a range from 32.0º F to 212.0º F (0.0º C to 100.0º C). It is capable of sensing outside that range with diminished accuracy. The "**T**" command will request the temperature in Fahrenheit from the DaqPod. Using the "**t**" command will request the temperature response and will include descriptors. If you want to sense temperatures above 150º F it is recommended that you use a remote temperature sensor. Air temperature is available in English and Metric units.

- Next is the Relative Humidity (RH) sensor reading is measured in a percentage from 0.0 to 100.0 percent. 0.0 being as dry as the scale gets and 100.0 being as moist as the scale gets. Relative Humidity to relative to temperature. The temperature of the air determines the amount of water vapor the air can hold. This is called Saturated Water Vapor Pressure and is

expressed as a pressure in inches of mercury. Relative Humidity is the percentage of the Saturated Water Vapor Pressure that the air is currently holding. The command to request relative humidity from the DaqPod is "**H**", or "**h**" to include the descriptors.

- Finally the Battery (BT) fuel gauge will tell you how much life is left in the 9-volt battery. When a new fully charged battery is installed, the gauge will read approximately 98 percent. The scale is linear down to approximately 25 percent. The recommended replacement of the battery is at 25 percent; however the unit will continue working down to 0 percent on the fuel gauge, with diminished accuracy. To request the battery power level use the "**P**" command for numbers only or use "**p**" to get the battery level with descriptors.

- Air Density is a computed reading which is dependant on the three atmospheric sensors in the DaqPod. It is the density of the air expressed in pounds per cubic foot. The algorithm for the Air Density conversion is the same algorithm which pilots use to calculate required power level for takeoff. To request the Air Density from the DaqPod use the "**D**" for a numbers only and a "**d**" for the Air Density number with descriptors. Air density is only available from the unit in English unit; however you can use the DaqPod Terminal Software to obtain Metric units.

- Density Altitude is your apparent altitude with respect to the Air Density. As the air density gets lower the apparent altitude gets higher. This is not very noticeable with human senses, but your air-based machine's performance will notice it. As the altitude gets higher the density of the air gets lower and the available oxygen gets lower. With less oxygen available to an engine, which depends on oxygen to burn fuel, will produce less power. Density Altitude is expressed in feet above sea level. This compound algorithm uses all three atmospheric sensors and the Air Density algorithm to produce Density Altitude. To request Density Altitude from the DaqPod use the "**C**" command for numbers only and "**c**" command for numbers and descriptors. Density altitude is only available from the unit in English units; however you can use the DaqPod Terminal Software to obtain Metric units.

Command Set:

The DaqPod uses the ASCII communication set to make programming a user interface and communicating with the device as easy as possible. To keep the interconnect simple and easy to use, the serial port wires are kept to a minimum. There are only transmit, receive, and ground. Because there are no hardware handshaking signals. It is important to include the correct delay before trying to read data from the DaqPod. In the communication sequence the host would transmit a single ASCII character command, wait for a variable amount of time, then read the data from the DaqPod. The amount of delay is varies based upon the amount of data there is to be read back. For example, if we were to write a command such as "**T**" the amount of delay would be short because we are only reading back 1 byte - the temperature. However, if we were to write the command "**?**", we would have to delay about 300 milliseconds while we are waiting for the list of command variables to download from the DaqPod. The host computer initiates all communications with the DaqPod. There should never be any un-requested data coming from the DaqPod.

The following is a “conversation” between a host computer and the DaqPod;

Host sends “**X**”, wake up
Host delays 10 milliseconds
Host sends “**T**”, transmit temperature, delays 70 milliseconds
DaqPod sends “79”, response to temperature query
Host sends “**H**”, transmit humidity, delays 70 milliseconds
DaqPod sends “39”, response to humidity query
Host sends “**B**”, barometer query, delays 70 milliseconds
DaqPod sends “29.79”, response to barometer query
Host sends “**N**”, transmit goes to sleep command

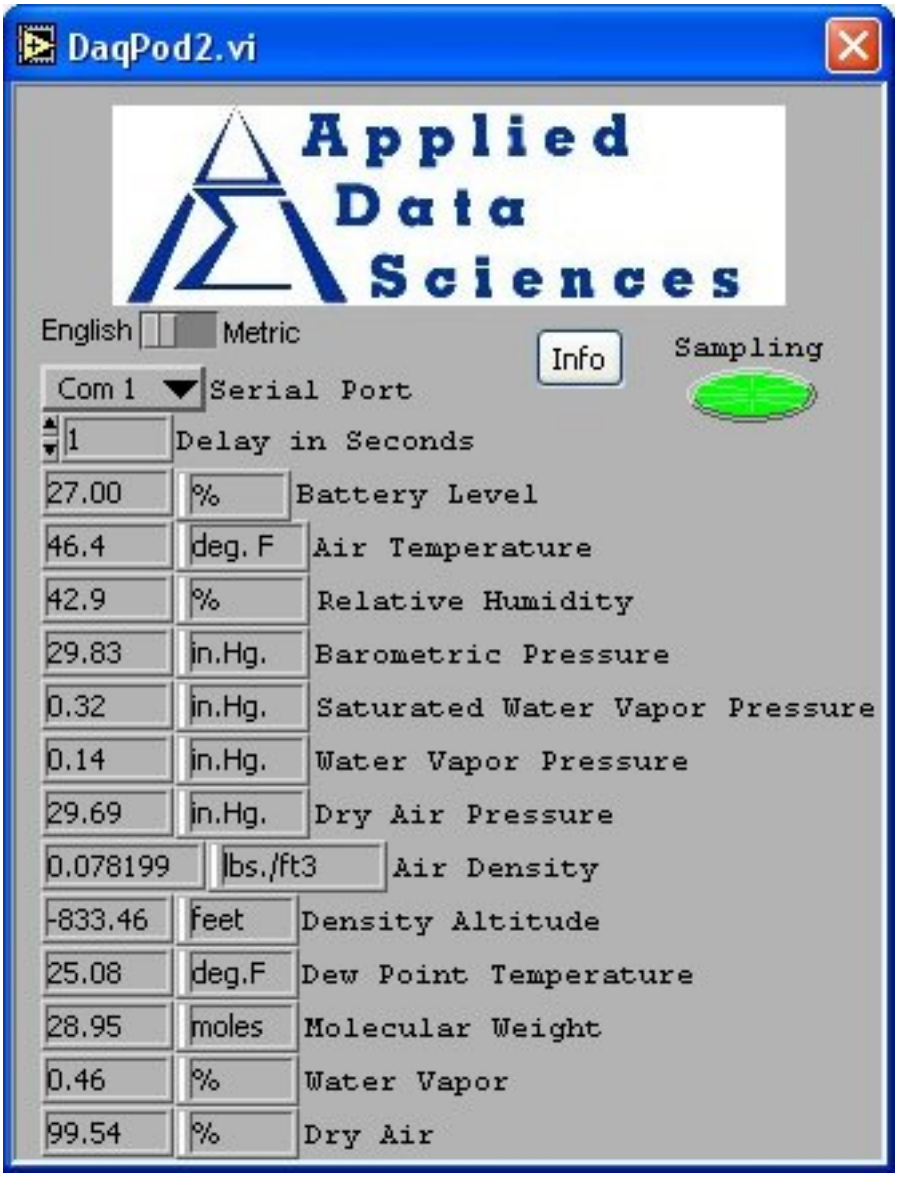
The following table describes what each ASCII command does, the amount of delay it needs, and the format it is transmitted as;

Command Set Table:

Command	Delay	Description of command and format
a	100mS	Transmit all sensor readings with descriptors
A	100mS	Transmit all sensor readings with descriptors
b	100mS	Transmit barometric pressure with descriptors
B	100mS	Transmit barometric pressure without descriptors
c	100mS	Transmit density altitude with descriptors
C	100mS	Transmit density altitude without descriptors
d	100mS	Transmit air density with descriptors
D	100mS	Transmit air density without descriptors
h	100mS	Transmit relative humidity with descriptors
H	100mS	Transmit relative humidity without descriptors
n	10mS	Power down (power savings mode)
N	10mS	Power down (power savings mode)
o	10mS	Go into calibration mode
O	10mS	Go into calibration mode
p	100mS	Transmit battery power level with descriptors
P	100mS	Transmit battery power level with descriptors
q	300mS	Transmit unit information
Q	300mS	Transmit unit information
t	100mS	Transmit temperature with descriptors
T	100mS	Transmit temperature without descriptors
x	10mS	Wake up sleeping unit
X	10mS	Wake up sleeping unit
?	300mS	Transmit command list with descriptors
/	300mS	Transmit command list with descriptors

It is important to not overrun the DaqPod's 2 byte input serial buffer. This buffer is important for the proper functioning of the DaqPod. If this buffer is overrun it will start dropping commands to the unit. When you are writing commands to the unit send only 1 character at a time. Then read the response from the DaqPod before writing the next command character.

DaqPod Terminal Software:



The DaqPod Terminal Software is included free with the DaqPod. Its purpose is to be a low cost interface for users who want instant access to the DaqPod. The software runs in a loop, continuously monitoring the DaqPod. As it receives the raw data, it will display the values and also refresh the computed values.

The ring control labeled “Serial Port” sets the COM Port under windows using the same COM number as Windows. The slide switch above the readings will toggle all the readings from English units to Metric units and back.

The DaqPod will "nap" between samples. You can look at the front of the DaqPod to tell the status of the unit. When the unit is napping the LED will be off. If the DaqPod is sampling, the LED will be on. The “Info” button will request the unit information from the DaqPod and put it in a pop-up window. The “X” button will close the Terminal Program and the Runtime Engine. The Terminal software requests the temperature, humidity and barometric pressure from the DaqPod. The rest of the values that you see on the Terminal Software are calculated.

Polled readings:

1. Air Temperature (in degrees Fahrenheit)
2. Relative Humidity (as a percentage of saturated water vapor pressure)
3. Barometric Pressure (in inches of mercury)
4. Battery Level (in a percentage of maximum)

Computed readings:

1. Saturated Water Vapor Pressure (in inches of mercury)
2. Water Vapor Pressure (in inches of mercury)
3. Water Vapor Percentage (percentage of air which is water vapor)
4. Dry Air Pressure (in inches of mercury)
5. Dry Air Percentage (percentage of air which is dry air)
6. Molecular Weight (represents weight of single air molecule)
7. Dew Point Temperature (temperature where humidity exceeds saturated water vapor pressure and water droplets come out of the solution called air)
8. Air Density (mass of air computed in weight per volume)
9. Density Altitude (the apparent altitude based on weather conditions)

DaqPod
Terminal Software Installation

Insert the CD labeled “DaqPod Terminal Software” into your CDROM drive. It should automatically install.

If the software does not automatically install, go to the CDROM root directory and run a program called setup.exe

The setup program will prompt you to select an installation directory.

Choose the directory and press finish.

The installation program will create a program group for DaqPod and place it on your desktop.

To run the software double click on the DaqPod Icon.

Select the com port using the ring control for the com port.

DaqPod
Product Specifications

Processor:	Microchip PIC16F876-04/L
Processor Speed:	4 Megahertz
Program Memory:	8192, 14 bit words (14 kilobytes)
Processor RAM:	384 bytes
Processor EEPROM:	256 bytes
Processing Speed:	1 MIPS
Air Density Calculation:	+/- 1% accurate, in Pounds per Cubic foot
Density Altitude Calculation:	+/- 1% accurate, in Feet above sea level
Pressure Sensor:	Fujikura XFAM-115KPASR
Pressure Range:	0 PSIA to 16 PSIA
Pressure Resolution:	0.01 inches of mercury
Temperature Sensor:	National LM34CAZ
Temperature Range:	32.0º F. to 212.0º F.
Temperature Resolution:	0.1º F
Humidity Sensor:	Honeywell HIH-3610-001
Humidity Range:	0.0% RH to 100.0%RH
Humidity Resolution:	0.1%
Voltage Requirement:	9 Volt Battery
Battery Size Requirement:	Standard 9-Volt Alkaline
Current Requirement:	20 Milliamps
Power Consumption:	100 MilliWatts

DaqPod
Limited Manufacturers Warranty

Applied Data Sciences will honor a limited warranty on this product for a period of one year after the purchase date. This warranty covers manufacturer's original parts and workmanship. If this product fails, the manufacturer will repair or replace the unit within the warranty period.

Upgrades are not covered by the warranty, and are treated as purchasing additional parts or software. Out of warranty repair charges are a minimum ½ hour at $35 per half hour.

Practices that will void the warranty are as follows:

- Immersing the DaqPod in water.
- Exposing the DaqPod to microwave radiation.
- Exposing DaqPod to temperatures above 150ºF while in operating mode.
- Intentional physical damage.

Do not, under any circumstance, put your DaqPod in a hot oven, a microwave oven, a fireplace or a barbecue. The DaqPod is not heat proof and excessive heat will completely destroy it, and will void the warranty. Also, the DaqPod is not waterproof, so Do Not immerse in water or any other liquid, especially flammable liquids.

For Information on repairs, upgrades, or questions contact:

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