Pegasus FlyAway Kit

A Portable Weather Station

User Manual

Version 1.10

Printed in U. S. A.

Welcome!

Welcome to the Pegasus family of users and congratulations on your purchase of the Pegasus FlyAway Kit Portable Weather Station.

The Pegasus FlyAway Kit is quite easy to install and you may be tempted to skip the installation procedure or other portions of this manual. We recommend that you resist that urge. A thorough knowledge of these installation and calibration procedures will greatly increase the usefulness and the accuracy of your instrument. In particular, a proper installation will help prevent problems with both operation and maintenance.

Please read this manual completely prior to installation.

Important Notice: Shipping Damage

BEFORE YOU READ ANY FURTHER, please inspect all system components for obvious shipping damage. The Pegasus FlyAway Kit is a high precision instrument and can be damaged by rough handling. Your unit was packaged to minimize the possibility of damage in transit. Therefore, we recommend that you save the shipping container for any future shipment of your Pegasus unit.

In the event your order arrives in damaged condition, it is important that the following steps be taken immediately. The title transfers automatically to you, the customer, once the material is entrusted to the transport company.

NOTE: DO NOT RETURN THE INSTRUMENT TO COLUMBIA WEATHER SYSTEMS until the following steps are completed. Failure to follow this request will jeopardize your claim.

1. Open the container and inspect the contents. Do not throw away the container or any damaged parts. Try to keep items in the same condition as originally received.
2. Notify the transport company immediately in writing, preferably by facsimile, about the shipping damage.
3. Wait for the transport company's representative to inspect the shipment personally.
4. After inspection, request permission from Columbia Weather Systems for return of the damaged instrument by calling the Capricorn Service Department, (503) 629-0887.
5. Return approved items to us at the following address:

   Columbia Weather Systems, Inc.

   2240 NE Griffin Oaks Street, Suite 100

   Hillsboro, OR 97124
6. After return authorization is issued and we receive the instrument, an estimate of the cost of repair will be sent to you for submittal to the transport company as a claim.

Table of Contents

SECTION 1: INTRODUCTION

The Capricorn 2000 System

The Pegasus FlyAway Kit portable weather station combines digital quality and professional-grade equipment with the need for a highly mobile weather station to create a state-of-the-art, rapid deployment weather monitoring system for Emergency Operations.

Pegasus is specifically designed for firefighters, HazMat, Emergency Management, and Disaster Preparedness personnel when weather monitoring is crucial to the public's safety.

Pegasus allows Accident and Incident Commanders to create a fully functional weather operation within minutes, automatically collecting weather data and providing a cost-effective force-multiplier not available in any other portable weather station.

Specifications

Temperature

Type: digital semiconductor

Range: -67° to 257°F

Accuracy: ±0.9°F

Resolution: 0.01°F

Barometric Pressure

The barometric pressure sensor is located inside the Control Module and is part of the weather station circuit board.

Type: silicon shear stress strain gauge; temperature compensated and calibrated

Range: 27 to 33.96 in. Hg

Accuracy: ±0.03 in. Hg over range (at sea level, with temperature between 32° and 182°F)

Resolution: 0.01 in. Hg

Wind Speed

Type: chopping disc anemometer, three cups

Range: 0 to 125 mph

Accuracy: ±1 mph from 5 to 20 mph, ±5% from 20 to 125 mph

Mechanical Threshold: 0.5 mph

Resolution: 1 mph

Wind Direction

Type: wind vane using digital gray code

Range: 360 degrees.

Relative Humidity

Type: Capacitance

Range: 0 to 100%

Accuracy: ±3% (or better) from 10 to 90% RH at 68° F

Temperature Effect: <±1.5% RH from 14° F to 140° F

Stability: ±2% RH over 2 years

Resolution: 1% RH

Wireless Transceiver

Frequency: 2.402 - 2.478 GHz, FHSS (license-free)

Range: Up to 500 feet (152 m) indoors; Up to 10,000 feet (3050 m) line-of-sight

Output Power: 200 mW

Battery Power

Output: 12 VDC, 12 AH, 32-hour operation

SLA (Sealed Lead Acid) Gel Batteries

Control Module

Dimensions: 14 x 11 x 6.5 inches

Weight: 6.7 lbs/3 kg.

System Weight

Weather station and caring case: 38 lbs

Tripod and canvas bag: 17 lbs

Battery system and case: 23 lbs

SECTION 2: PHYSICAL DESCRIPTION

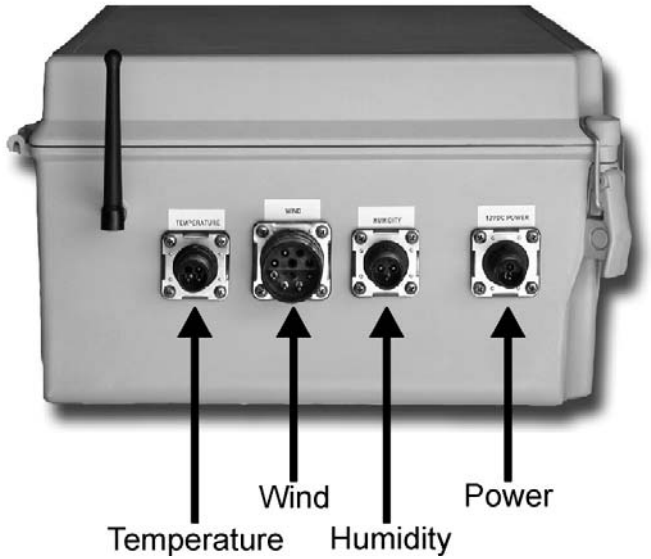
Control Module

The Control Module consists of the System board and a 2.4 GHz transceiver housed in a weatherproof fiber glass enclosure with external sensor and power connectors.

The System board has an on-board barometric pressure sensor and a system fuse (including a spare fuse). The System board also has in-line rechargeable batteries to preserve the datalog and system configuration when power is absent.

The Control Module dimensions are: 14 x 11 x 6.5 inches and weighs: 6.7 lbs/3 kg.

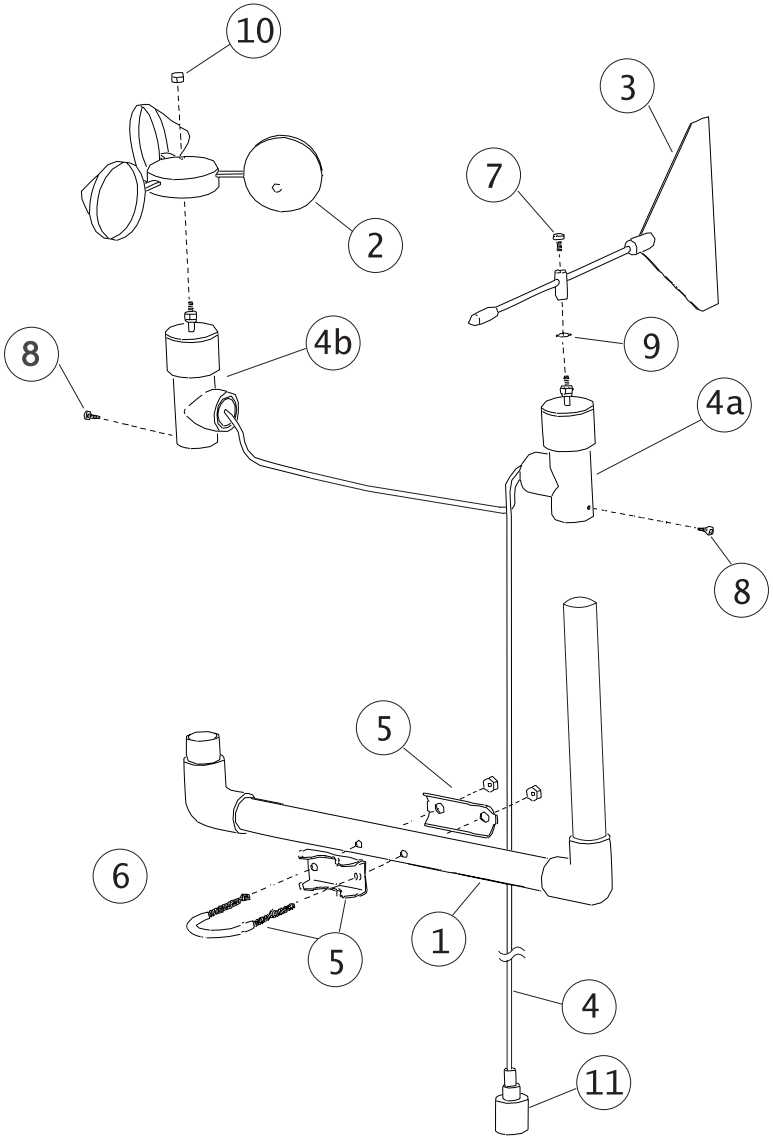
Control Module Connections



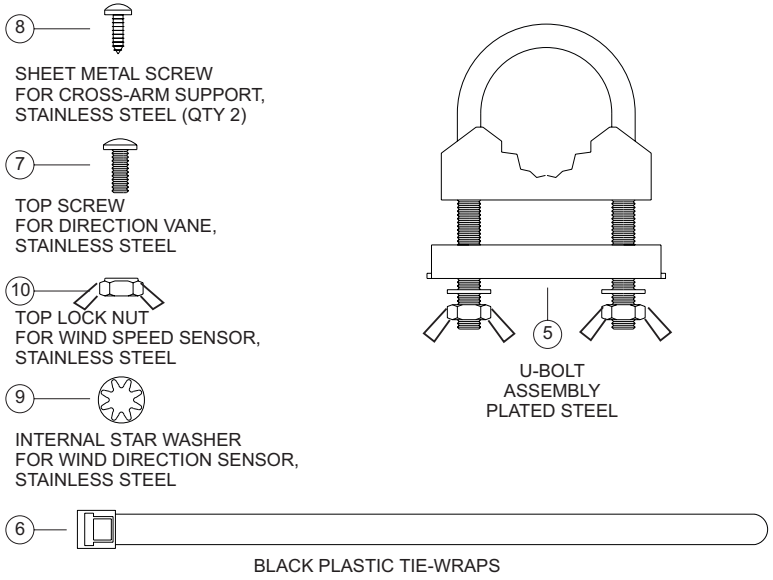
Wind sensor

The wind speed and direction sensors use a solid state, infrared optical design to decrease wear and improve reliability. These rugged sensors, with a design incorporating years of experience and testing, are enclosed in a rugged PVC housing surrounding stainless steel parts. These sensors operate in extreme temperature and wind conditions for years.

Wind sensor components



Hardware Kit Assembly Kit



1. Cross Arm Support
2. Wind Cup Hub Assembly (with spare top lock nut)
3. Wind Direction Vane (with spare top screw)
4. 10-foot wind sensor cable with connector assembly

4a. Wind Direction sensor body (white, T-shaped, heavy duty PVC fitting with two cables protruding)

4b. Wind Speed sensor body (white, T-shaped, heavy duty PVC fitting with one cable protruding)

5. Hardware Assembly Kit
6. Black plastic tie wraps (UV-resistant)
7. Top screw (for clamping the direction vane shaft to the vane holder), stainless steel
8. Stainless steel sheet metal screws (for mounting wind sensors to Cross Arm Support)
9. Top lock nut (to be placed on threaded shaft of wind speed sensor, above wind cup assembly
10. Top lock nut (to be placed on threaded shaft of wind speed sensor, above wind cup assembly), stainless steel
11. Wind Sensor Cable Connector

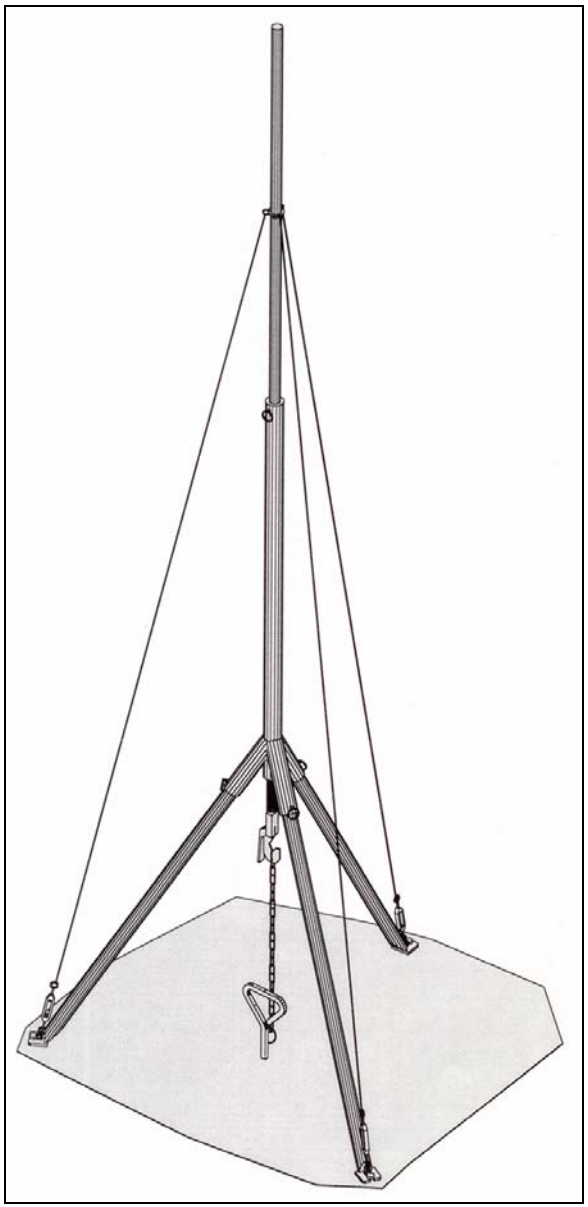
Temperature sensor

The Pegasus comes standard with one temperature sensor with 10 feet of cable. This digital, semiconductor-type probe reduces susceptibility to noise interference, and increases accuracy. The sensor is calibrated at the factory traceable to NIST standards.

Relative Humidity sensor

This optional capacitive relative humidity sensor is compact and easy to use. It is easily installed in the self-aspirating radiation shield for protection from the sun and rain. This sensor offers long-term stability with minimal drift. Because the sensor is a capacitive device, it will not be affected by surface contamination in unclean environments. Since the sensor element is socketed and laser trimmed it can be easily replaced in the field without any additional calibration. The relative humidity sensor comes with a standard 10-foot cable and a quick disconnect connector.

Tripod



Tripod Model T-1000 is designed to provide up to 10 feet of stable, secure support for your meteorological sensors.

The T-1000 is constructed from welded aluminum and is powder coated for appearance and longevity. The 15-pound tripod can

easily support up to 60 pounds of equipment. The tie-down kit allows for additional security in high-wind areas.

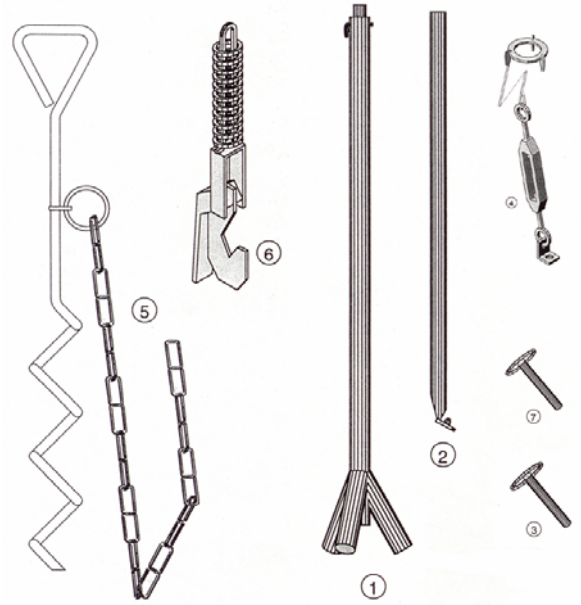
Set up takes less than five minutes. Simply insert the legs into the main body and install the stainless steel retainer pins. Extend the mast to the desired height and insert another retainer pin. Install the guy wires and you're ready to go!

Specifications

Capacity: Supports up to 60 lbs.

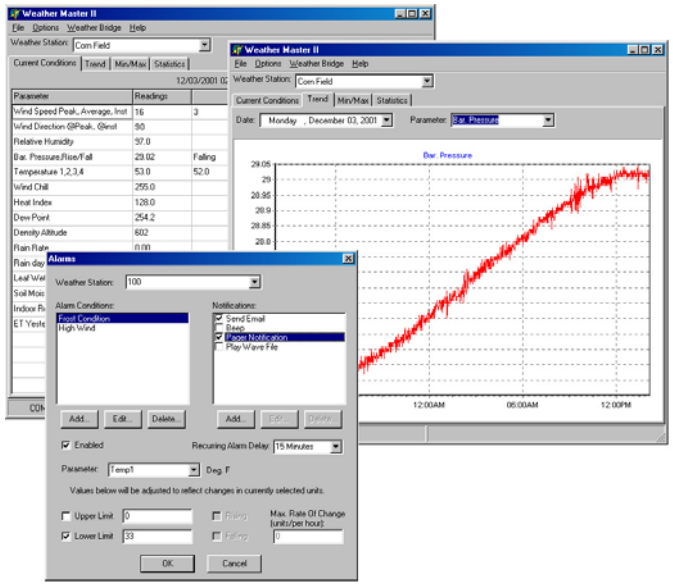
Shipping Weight: 17lbs

Shipping Box Dimensions: 63" x 8" x 8"



Item #	Description	Qty
1.	Body/Mast Assembly	1
2.	Legs	3
3.	Legs retainer Pins	4
4.	Guy Wire Ring with 3 Wires and Turnbuckles	1
5.	Anchor Screw with Chain	1
6.	Spring Clamp	1
7.	Mast retainer Pin	1

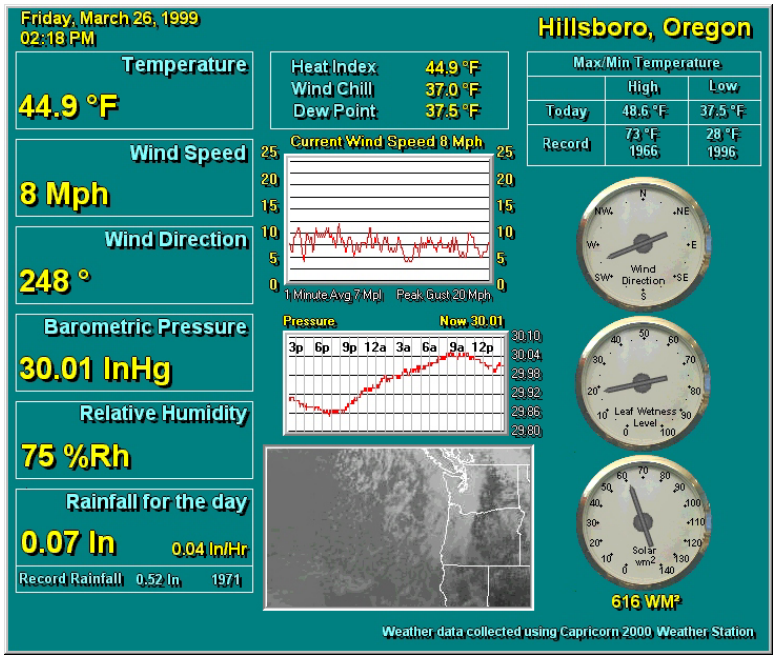
WeatherMaster 2000™ Software (optional)



WeatherMaster 2000 is a professional grade weather monitoring software. This software package is designed for specialized markets that require robust weather calculations, interoperability with computer models, and data interfaces to other industrial systems. WeatherMaster 2000 utilizes Microsoft Access database for easy data access and manipulation.

WeatherMaster 2000 is also capable of monitoring multiple stations via a wireless link.

Weather View 32™ Software (optional)



Operating in Windows graphic environment, Weather View 32 helps you monitor, record, and store local weather data for current or future analysis.

Weather View 32 offers:

- User-defined real time monitoring display
- Internet and email interface
- Calculated parameters including wind chill, dew point, heat index and degree days
- Monthly calculations for degree days heating and cooling
- Full-featured graphing and printing capabilities
- Six separate alarms functions
- A Climatological database that covers the U.S. and Canada
- Modem access for remote weather stations

RetrieverCC™ Palm OS Software (optional)

RetrieverCC™ provides a user-friendly Palm™ program for communication with the Capricorn 2000™ and Pegasus FlyAway Kit™ weather stations. The RetrieverCC, running on a Palm handheld, communicates with the weather station via an RS-232 port to view current weather data, extract logged data and perform other configuration functions.

RetrieverCC can download the datalog from multiple weather stations for export to a PC for additional data analysis and storage.

Features

- Operates on most Palm Handhelds (see Requirements).
- Easy list-based selection of the weather station functions.
- Parses data output into easily readable fields.
- Data capture capability.
- Retains multiple data-capture sessions (capacity subject only to available memory).
- User-named data-capture sessions.
- Review of existing data capture sessions on the handheld.

Requirements

- A Palm device running Palm OS® version 3.1.1 or later (Palm V-series, IIIx, IIIe, IIIxe, IIIc, all m-series, i-series, and also an OS upgraded Palm III).
- Palm Desktop Software installed on the PC.
- An RS-232 serial cable for the handheld.
- A Capricorn 2000 serial cable (included with software).

Weather Display Console (Optional)

The Capricorn 2000 Weather Display uses “intelligent” touch-screen technology. With its programmable microprocessor and abundant memory, the Capricorn 2000 Weather Display can display weather information, perform complex computations, and store relatively large amounts of weather data.

The Capricorn 2000 Weather Display is also available in Aviation and Agricultural Editions:

Aviation Edition: Density Altitude with additional wind speed and direction calculations and charts.

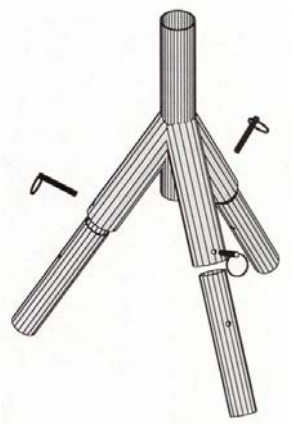
Agricultural Edition: Evapotranspiration and degree day calculations.

The Weather Display is also available in a 19” rack-mount chassis.

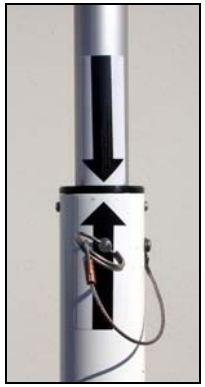
SECTION 3: INSTALLATION

1. Install the radiation shield by slipping it over the sensor mast extension. Do not tighten wing nuts at this time.
2. Slip the guy wire collar over the sensor mast
3. Install the wind sensor assembly on the top of the mast. Align the North mark on the wind sensor clamp to the North mark on the mast and tighten the assembly using the two wing nuts.

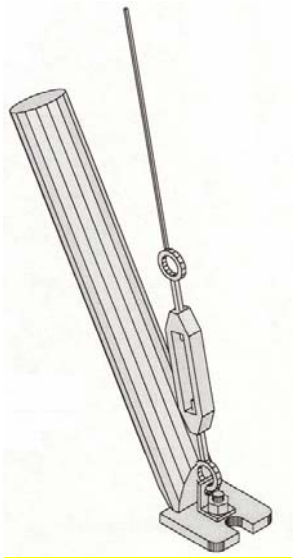
4. Connect the three legs using the pins as shown below.



5. Extend the mast to full length and secure with the attached pin. Be sure that the North marks on the sensor mast and the tripod body are aligned.



6. Tighten the guy wire turnbuckles so that the sensor mast is aligned up right.



7. Position the radiation shield toward the lower part of the sensor mast extension and tighten using the two wing nuts.

8. Using the attached compass, orient the entire tripod system to magnetic North. The wind sensor cross arm assembly should be aligned with the North/South direction and the wind cups are pointing to North as shown below.

9. Secure the tripod using the spring-loaded chain attached to the corkscrew drilling stake (for soil) or the pavement spike (for hard surfaces). Pavement spikes can be purchased from local hardware stores.
10. Attach the Control Module to the tripod using the buckle strap.
11. Connect the sensor cables to the Control Module.
12. Place the battery in its case at the base of the tripod. Connect the power cable to the battery terminals first and then to the Control Module external connector.

The system is now operational and is ready to transmit weather data.

Section 4: Display Console and Software Installation

The Pegasus FlyAway Kit offers several options to view and collect the weather data. All of these options (with the exception of the RetrieverCC) use a wireless link to communicate with the control module.

Weather Display Console

Please refer to the Weather Display user manual for installation and operation instructions.

WeatherMaster 2000™ Software

Please refer to the WeatherMaster 2000 user manual for installation and operation instructions.

Weather View 32™ Software

Please refer to the Weather View 32 user manual for installation and operation instructions.

RetrieverCC™ Palm Software

Please refer to the RetrieverCC user manual for installation and operation instructions.

Section 5: Operation

The Pegasus communicates with a computer or Weather Display console via wireless interface. The Control Module has two ports available on the back panel (RJ-11 jacks).

RS-232 Modem serial port

This is the main serial port in the system. It is usually connected to the radio transceiver for communication with a computer or a Weather Display.

RS-232 Aux serial port

This is a secondary serial port. It is usually used for direct communication with a computer or a Palm device.

Communication

Normally the weather software or the Weather Display is used for monitoring. Configuration is done through the menu selection of the software or the display console.

The commands described in this section are used when the user wishes to communicate directly with the system using a “terminal” software program such as Hyper Terminal (available with Windows operating systems).

The protocol for both serial ports is the following:

Bits per Second (baud rate): 9600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

All commands must be entered using upper case letters and followed by a carriage return.

The weather station will return "ok" after the results of each command. If the command is incorrect, the weather station will return "?".

Setting date and time

SET-DATE: This command is used to set the internal calendar to the appropriate date. It uses space delimiters between the month field, the day field, the year field, and the command field.

Example: 12 25 96 SET-DATE sets the date to 12/25/1996 and 1 5 01 SET-DATE sets the date to 1/5/2001

SET-TIME: This command is used to set the internal clock to the appropriate military time (24 hours clock). It uses space delimiters between the hours field, minutes fields and the command field.

Example: 13 46 SET-TIME sets the time to 1:46 PM

Displaying date and time

DATE-TIME: This command is used to display the system date and time. When used the weather station will return the date followed by the time, comma delimited.

Example: 02/11/1998,13:20ok

Displaying current sensor readings

There are three ways to display current sensor readings:

The POLL command

POLL: This command is used to display the current sensor readings in a report format. When a POLL command is issued, the weather station will interrogate all the sensors and will display the information

Example:

11:00		Time
02/11/1998		Date
50.14	Degrees F	Temperature 1
70.89	Degrees F	Temperature 2
68.33	Degrees F	Temperature 3
64.46	Degrees F	Temperature 4
29.88	Inches Hg	Barometric Pressure
006	MPH	Wind Speed
SE		Wind Direction
073	Percent	Relative Humidity
00.06	Inches	Rain (Today)
04.43	Volts	Leaf Wetness
01.30	Volt	X1
04.58	Volts	X2
ok		

The SAMPLE command

SAMPLE: This command is used to display the current sensor readings in a one line record format (the same format as the datalog). The record starts with the letter S followed by the date and time of the sample, followed by the sensor values and ends with a check sum value. All of these fields are comma delimited.

Example:

S,02/11/98,11:09,36WD,003WS,00.06R,072RH,29.88P1,+050.59T1,+070.77T2,+068.23T3,
+064.60T4,04.43LW,0.00X1,0.00X2,6007ok

Where, WD is wind direction, WS is wind speed in MPH, R is rain fall in inches, RH is relative humidity percentage, P1 is barometric pressure in Inches-Hg, T1 through T4 are the four temperature sensors in degrees F, LW is leaf wetness in volts, X1 is typically solar radiation (5.00 volts equals 2000 Weather Master 2000-2) and X2 is used for additional sensors (X1 and X2 channels are not available with the Pegasus FlyAway Kit).

Temperature channels that are not defined or connected will have a +255.00 reading.

Wind direction is displayed in a 64 degree compass as follows:

0	N
4	NNE
8	NE
12	ENE
16	E
20	ESE
24	SE
28	SSE
32	S
36	SSW
40	SW
44	WSW
48	W
52	WNW
56	NW
60	NNW

The Short commands

WD: will display wind direction in a 64 compass points

WS: will display wind speed in MPH

R1: will display the rain fall for the day in inches

RH: will display relative humidity percentage

P1: will display the barometric pressure in inches-Hg

T1: will display the temperature for the first temperature probe in degrees F

T2: will display the temperature for the second temperature probe in degrees F

T3: will display the temperature for the third temperature probe in degrees F

T4: will display the temperature for the fourth temperature probe in degrees F

LW: will display leaf wetness in volts. The range may vary per sensor. Typically, 0.5 volts indicates saturated condition and 4.5 volts indicates dry conditions.

X1 and X2 channels are not used with the Pegasus FlyAway Kit

Datalog

The Pegasus weather station has a built in circular datalogger. The datalog holds records of sensor readings (Samples) and High/Low information. Both types of records (Samples and High/Low) are recorded at user defined intervals.

The datalog can hold up to 511 records. A Sample occupies on record and High/Low information occupies four records.

Setting datalog intervals

The interval for the Sample records in the datalog is user selectable. The interval duration is restricted to the following: 1, 2, 3, 4, 5, 6, 10, 15, 20, 30, and 60 minutes.

n MEAS-INT: This command sets the Sample interval in the datalog. n is the interval duration in minutes.

Example: 15 MEAS-INT will cause the weather station to save a Sample record every 15 minutes.

Setting Hi/Lo intervals

The interval for the High/Low records in the datalog is user selectable. The interval duration is restricted to the following: 1, 2, 3, 4, 6, 8, 12 and 24 hours.

n HI/LO-INT: This command sets the High/Low interval in the datalog. n is the interval duration in hours.

Example: 12 HI/LO-INT will cause the weather station to save High/Low records (total of four records) every 12 hours.

Displaying the datalog

ALL: This command will display the complete datalog (511 maximum records)

Example: In this example the Sample interval is set at one minute and the High/Low interval is set at one hour and the datalog has 13 record (9 Sample records and 4 High/Low records).

13 records

S,02/11/98,13:56,32WD,007WS,00.07R,074RH,29.85P1,+052.31T1,+071.62T2,+069.17T3,
+065.57T4,01.88LW,0.00X1,0.00X2,6015

S,02/11/98,13:57,32WD,005WS,00.07R,074RH,29.86P1,+052.74T1,+071.83T2,+069.26T3,
+065.69T4,01.70LW,0.00X1,0.00X2,6019

S,02/11/98,13:58,32WD,006WS,00.07R,072RH,29.85P1,+052.76T1,+071.64T2,+069.35T3,
+065.75T4,01.74LW,0.00X1,0.00X2,6020

S,02/11/98,13:59,32WD,006WS,00.07R,071RH,29.85P1,+052.94T1,+071.86T2,+069.36T3,
+065.81T4,01.74LW,0.00X1,0.00X2,6022

H,02/11/98,14:00,013,13:25WS,081,13:40RH,29.86,13:27P1,+053.23,14:00T1,+072.27,13:
52T2,+069.59,13:31T3,+065.88, 14:00T4,01.70,13:57LW,0.00,14:00X1,0.00,14:00X2,8351

L,02/11/98,14:00,013,13:25WS,067,13:25RH,29.84,13:25P1,+050.17,13:39T1,+071.29,13:2
6T2,+068.33,13:42T3,+065.34, 13:25T4,04.41,13:27LW,0.00,00:00X1,0.00,00:00X2,8349

S,02/11/98,14:00,28WD,000WS,00.07R,071RH,29.85P1,+053.23T1,+072.02T2,+069.26T3,
+065.88T4,01.76LW,0.00X1,0.00X2,5998

S,02/11/98,14:01,28WD,003WS,00.07R,071RH,29.85P1,+053.67T1,+072.52T2,+068.91T3,
+065.88T4,01.78LW,0.00X1,0.00X2,6018

S,02/11/98,14:02,32WD,006WS,00.07R,069RH,29.85P1,+053.70T1,+072.86T2,+068.89T3,
+065.86T4,01.84LW,0.00X1,0.00X2,6027

S,02/11/98,14:03,32WD,003WS,00.07R,068RH,29.85P1,+053.73T1,+073.13T2,+069.21T3,
+065.86T4,01.88LW,0.00X1,0.00X2,6009
S,02/11/98,14:04,28WD,005WS,00.07R,067RH,29.85P1,+053.41T1,+072.48T2,+069.36T3,
+065.86T4,01.94LW,0.00X1,0.00X2,6021ok

Note that the Sample records start with the letter S and the High/Low records start with the letter H and L respectively.

NOW: This command will display the last record in the datalog

n GET: This command will display a user defined number of records in the datalog, where n is the number of records.

Example: 10 GET will display the last ten records in the datalog.

Resetting Hi/Lo

RESET-HI/LO: This command will erase the high/low values from memory for the current high/low interval.

Resetting the datalog

RESET-DATA: This command will erase the datalog and will insert one current Sample record.

Displaying current Hi/Lo

HIGH: This command will display the current high record. The High record starts with the letter H followed by the date and time the record was requested followed by the high values and the time for wind speed, relative humidity, pressure, temperatures, leaf wetness and two undefined sensors (X1 and X2). The high value of wind speed is the wind gust.

Example:

H,02/11/98,14:00,013,13:25WS,081,13:40RH,29.86,13:27P1,+053.23,14:00T1,+072.27,13:52T2,+069.59,13:31T3,+065.88, 14:00T4,01.70,13:57LW,0.00,14:00X1,0.00,14:00X2,8351

LOW: This command will display the current low record. The Low record starts with the letter L followed by the date and time the record was requested followed by the low values and the time for wind speed, relative humidity, pressure, temperatures, leaf wetness and two undefined sensors (X1 and X2). The low value of wind speed is the high 4 second sustained wind average.

Setting temperature offsets

Temperature offsets are used to calibrate the temperature probes.

n TCAL#: This command is used to enter an offset for a temperature probe. Where n is the offset in 1/100 of a degree F and # is the temperature probe number.

Example: 231 TCAL2 adds 2.31 degree F to the temperature reading from temperature probe two and -231 TCAL2 subtracts 2.31 degrees F from the reading.

Please refer to the Temperature Calibration section for more information.

Setting barometric pressure altitude and offset

n ALT: This command sets the altitude of the weather station, where n is the altitude in feet.

Example: 225 ALT sets the altitude to 225 feet above see level.

n BAR-OFFSET: This command is used to enter an offset to the barometric pressure reading, where n is the offset in 1/100 of In.Hg.

Example: 34 BAR-OFFSET adds 0.34 in.Hg to the barometric pressure reading and -34 BAR-OFFSET subtract 0.34 in.Hg from the reading.

Please refer to Barometric Pressure Calibration for more information.

Display current settings

PARAMETERS: This command displays the current weather station settings and the number of records in the datalog.

Example:

Date & Time	02/11/1998,17:31
Measurement interval	1 minutes
Hi/Lo interval	1 hours
Records in memory	262
Pressure offset	38
Altitude	225
Temperature 1 offset	255
Temperature 2 offset	-25
Temperature 3 offset	55
Temperature 4 offset	155 ok

Continuous display of direction

NORTH: This command continuously displays the wind direction. This command is used for locating the north direction on the wind sensor. An <Esc> followed by a carriage return terminates this command.

Continuous display of wind information

1 XFER: This command continuously displays a Sample record every one minute and wind speed and direction every one second. The wind speed and direction record starts with the letter W followed by three digits for wind speed in MPH followed by two digits for wind direction.

Example:

W00124

S,02/11/98,17:44,24WD,001WS,00.08R,085RH,29.82P1,+048.56T1,+070.85T2,+067.24T3,

+065.08T4,01.74LW,0.00X1,0.00X2,6014

W00224

W00224

W00124

W00124

W00124

W00120okok

An <Esc> followed by a carriage return terminates this command.

XSET: This command defines the frequency the Sample record is displayed in the XFER output. The default frequency of the Sample record in the XFER output is 60 seconds. This frequency can be changed using the XSET command. For example, 15 XSET will cause the Sample record to be issued every 15 seconds. XSET will change the frequency of the XFER output on both serial ports.

CONT: This command will continuously output the Sample record at a specified interval. For example, 5 CONT will output a Sample record every 5 seconds. The time interval is limited to a range of 1 to 16 seconds.

S,05/01/99,09:44,40WD,000WS,00.00R,022RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4923

S,05/01/99,09:44,40WD,000WS,00.00R,023RH,29.09P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4932

S,05/01/99,09:44,40WD,000WS,00.00R,023RH,29.09P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4932

S,05/01/99,09:44,40WD,000WS,00.00R,023RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4924

S,05/01/99,09:45,40WD,000WS,00.00R,023RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4925

S,05/01/99,09:45,40WD,000WS,00.00R,023RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4925

S,05/01/99,09:45,40WD,000WS,00.00R,023RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4925

S,05/01/99,09:45,40WD,000WS,00.00R,023RH,29.10P1,+070.70T1,+255.00T2,04.80LW,5.00X1,0.10X2,4925

S,05/01/99,09:46,40WD,000WS,00.00R,023RH,29.10P1,+070.72T1,+255.00T2,04.80LW,5.00X1,0.10X2,4928

S,05/01/99,09:46,40WD,000WS,00.00R,023RH,29.10P1,+070.72T1,+255.00T2,04.80LW,5.00X1,0.10X2,4928okok

An <Esc> followed by a carriage return terminates this command. The output will stop after one more Sample record is issued. For example, if CONT is set to repeat the Sample record every 15

seconds (15 CONT) and an <ESC><RETURN> was entered, one more Sample record will be issued before the double ok is displayed indicating that the command is terminated.

SECTION 6: CALIBRATION

Calibrating the Barometric Pressure Sensor

The barometric pressure sensor is calibrated at the factory to a highly accurate digital pressure gauge (±0.02% of full range) and traceable to NIST and, therefore, it requires no further calibration.

The barometric pressure sensor in the Pegasus is temperature compensated from 32° to 185° F and has an accuracy of ±0.03 in.Hg.

Altitude Setting

After calibration at the factory, the altitude is set to zero. To get an accurate barometric pressure reading, the local altitude needs to be set in the weather station.

To set the altitude, use the ALT command and enter the altitude in feet. Please refer to Section 4: Operation for more information. The altitude can also be set using weather software or display console. Please refer to the software or display console user manual.

Note: The electronic transducer used to measure air pressure is sensitive to changes in elevation of as little as 10 ft. (3 m).

Optional Calibration Procedure

Even though the barometric pressure sensor is calibrated at the factory, the sensor can be re-calibrated on-site. This might be required if the original barometric pressure offset has been erased from memory, or if weather station needs to match a local source.

To re-calibrate the barometric pressure on-site:

Using a terminal program, set the barometric pressure offset to zero by entering: 0 BAR-OFFSET

Wait approximately 5 seconds, then take a pressure reading using SAMPLE, POLL or P1

Record the barometric pressure from a local reliable source at the same elevation as the Pegasus.

Calculate the barometric pressure offset as follows:

Barometric Pressure Offset = Source Reading - Pegasus Reading.

Enter the barometric pressure offset in 1/100 of in.Hg using the BAR-OFFSET command.

Calibrating the Wind Sensors

The wind speed sensor contains no components that can be calibrated by the user. Refer to the Installation Section for sensor North orientation.

Calibrating the Temperature Sensors

All Temperature sensors are calibrated at the factory to a superior grade ASTM mercury thermometer traceable to NIST. The calibration offset is recorded on the temperature sensor and on the end of the cable.

After initializing all the temperature sensors, enter the temperature offsets using the TCAL command. Please refer to Section 4: Operation for more information. TCal offsets are labeled on the sensor cable.

To calibrate the temperature sensors on-site, perform the following steps:

Prepare an ice bath by mixing two cups of crushed ice in two cups of water. Use an insulated container for best results. Allow the temperature throughout the ice bath to stabilize by waiting for about twenty minutes.

Stir the ice bath to mix the ice and water, wait for the ice to separate from the water, place the temperature sensor in the ice bath. Make sure that the sensor is not in direct contact with ice.

Take a temperature reading from the Pegasus using SAMPLE or POLL.

Calculate the temperature offset as follows:

Temperature offset = (32 - Pegasus reading) * 100

Enter the temperature offset using the TCAL command. Please refer to Section 4: Operation for more information.

Record the temperature offset on a label attached to the sensor.

Repeat the process for any other temperature sensor.

Calibrating the Humidity Sensor

The humidity sensor is calibrated at the factory and is traceable to NIST. No field calibration is required.

SECTION 7: MAINTENANCE

In normal use, the Pegasus should require very little maintenance. In the event of any problems, follow the procedures contained in Section 8: Troubleshooting, to determine whether the components are defective. If defective and needs to be returned to the factory for repair, refer to the Return For Repair Procedure in Section 9: User Support Information.

Control Module

The Control Module contains sensitive electronic components and should not be serviced by the user. If the LED on the inside circuit board is not on, check for proper installation of the battery supply system. Check to see if the fuse on the Control Module board needs to be replaced. If necessary, replace it with a 1.0 amp 250V fast acting fuse.

Barometric Pressure Sensor Maintenance

The barometric pressure sensor is located inside the weatherproof enclosure and should not be serviced by the user.

Temperature Sensor Maintenance

Check the temperature sensor cables during installation and periodically thereafter to make sure they contain no cuts, kinks or other abnormalities.

Wind Sensor Maintenance

Do not attempt to oil, grease or otherwise lubricate the wind sensors. The wind speed and direction bearings are permanently sealed and should not be tampered with. If it appears that the displayed wind speed values are substantially less than existing conditions, or that the wind direction display is sluggish in responding to changes in wind direction, it may be that the bearings need service. This can be tested by spinning the sensors. They should spin freely. If they do not, call the factory for service. All or part of the wind sensors may need to be replaced. Since the circuit is molded into the wind sensor housing, an electronic defect requires replacement of the sensor. The wind sensors are not designed for field repair.

Relative Humidity Sensor Maintenance

The Relative Humidity sensor does not require any field maintenance.

Section 8: Troubleshooting

Temperature Sensor Troubleshooting

If the Temperature sensor is reading a few degrees off when compared to a standard, the Temperature sensor may require re-calibration. Please refer to calibration procedure in Section 6: Calibrating the Temperature Sensor.

If the Temperature sensor is reading 255°F, the Temperature sensor may be disconnected from the Control Module. Check the cable from the sensor to the Control Module for any cuts or kinks. Check any splices to ensure good connection. Check the cable connection to the Control Module.

If replacing a Temperature sensor, all the new Temperature sensors and any other Temperature sensors connected to the Control Module should be re-initialized as follows:

1. Disconnect the temperature sensor from the Control Module.
2. Disconnect the power connector from the Control Module
3. Reapply power to the Control Module
4. Connect the temperature sensor to the Control Module
5. Disconnect the power connector from the Control Module
6. Reapply power to the Control Module

The temperature sensor is now initialized and should be reading the correct values.

Communication Problems

If the Pegasus is not communicating with the computer software or the Weather Display, please check the following:

1. Check power connections to the Control Module. Check the power LED on the circuit board inside the Control Module enclosure. If the light is not on, make sure the battery connected to the system is charged. Also check the on-board fuse. If blown, replace with the spare fuse located in the middle of the board.
2. Check all communication cable/connectors to be sure they are firmly connected.

3. Check the line-of-site between the Pegasus and the monitoring device. If the line-of-site is not direct, try moving the Pegasus to an unobstructed location.

SECTION 9: USER SUPPORT INFORMATION

This section consists of the following items:

1. Two-Year Limited Warranty: Please read this document carefully.
2. Return for Repair Procedure: This procedure is for your convenience in the event you must return your Pegasus or components for repair or replacement. Follow the packing instructions carefully to protect your instrument in transit.

Limited Warranty

Columbia Weather Systems, Inc. (CWS), warrants the Pegasus Weather Station to be free from defects in materials and/or workmanship when operated in accordance with the manufacturer's operating instructions, for two (2) years from date of purchase, subject to the provisions contained herein. CWS warranty shall extend to the original purchaser only and shall be limited to factory repair or replacement of defective parts.

EXCLUSIONS

Certain parts are not manufactured by CWS (i.e., certain purchased options, etc.) and are therefore not covered by this warranty. These parts may be covered by warranties issued by their respective manufacturers and although CWS will not warrant these parts, CWS will act as agent for the administration of any such independent warranties during the term of this warranty. This warranty does not cover normal maintenance, damage resulting from improper use or repair, or abuse by the operator. Damage caused by lightning or other electrical discharge is specifically excluded. This warranty extends only to repair or replacement, and shall in no event extend to consequential damages. In the event of operator repair or replacement, this warranty shall cover neither the advisability of the repair undertaken, nor the sufficiency of the repair itself.

THIS DOCUMENT REFLECTS THE ENTIRE AND EXCLUSIVE UNDERSTANDING OF THE PARTIES, AND EXCEPT AS

OTHERWISE PROVIDED HEREIN, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, PARTICULARLY THE WARRANTIES OF MERCHANT ABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Return for Repair Procedure

1. In the event of defects or damage to your system, first call the factory Capricorn Service Department Monday through Friday, 8:30 am to 4:00 pm PST, (503) 629-0887 to determine the advisability of factory repair. The Service Department will issue an RMA number (Return Merchandise Authorization) to help us identify the package when received. Please place that number on the outside of the box.
2. In the event factory service is required, return your Pegasus Weather Station as follows:

   A. Packing

   - Wrap sensor or component in a plastic bag first.
   - Pack in original shipping carton or a sturdy oversized carton.
   - Use plenty of packing material.

   B. Include:

   - A brief description of the problem with all known symptoms.
   - Your phone number.
   - Your return street shipping address (UPS will not deliver to a P.O. box).
   - Write the RMA number on the outside of the box.

   C. Shipping

   - Send freight prepaid (UPS recommended).
   - Insurance is recommended. (The factory can provide the current replacement value of the item being shipped for insurance purposes.)

D. Send to:

Columbia Weather Systems, Inc.
2240 NE Griffin Oaks Street, Suite 100
Hillsboro, Oregon 97124

E. C.O.D. shipments will not be accepted.

3. If your unit is under warranty, after repair or replacement has been completed, it will be returned by a carrier and method chosen by Columbia Weather, Inc. to any destination within the continental U.S.A. If you desire some other specific form of conveyance or if you are located beyond these borders, then you must bear the additional cost of return shipment.

4. If your unit is not under warranty, we will call you with an estimate of the charges. If approved, your repaired unit will be returned after all charges, including parts, labor and return shipping and handling, have been paid. If not approved, your unit will be returned as is via UPS COD for the amount of the UPS COD freight charges.

Reference

Glossary

Aspirating Radiation Shield

A device used to shield a sensor such as a temperature probe from direct and indirect radiation and rain while providing access for ventilation.

Barometric Pressure

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the “column” of air lying directly above the point in question.

Celsius Temperature Scale

A temperature scale with the ice point at 0 degrees and the boiling point of water at 100 degrees.

Dew Point

The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur. When this temperature is below 0°C or 32°F, it is sometimes called the frost point.

Fahrenheit Temperature Scale

A temperature scale with the ice point at 32 degrees and the boiling point of water at 212 degrees.

Heat Index

The heat index or apparent temperature is a measure of discomfort due to the combination of heat and high humidity. It was developed in 1979 and is based on studies of evaporative skin cooling for combinations of temperature and humidity.

.

Relative Humidity

Popularly called humidity. The ratio of the actual vapor pressure of the air to the saturation vapor pressure.

Sea Level Pressure

The atmospheric pressure at mean sea level, either directly measured or, most commonly, empirically determined from the observed station pressure.

In regions where the earth’s surface pressure is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at a point at sea level directly below.

Wind Chill

That part of the total cooling of a body caused by air motion.

Unit Conversion

Speed

Kilometers per hour = 1.610 x miles per hour

Knots = 0.869 x miles per hour

Meters per second = 0.448 x miles per hour

Feet per second = 1.467 x miles per hour

Temperature

Temperature in °C = 5/9 (temperature in °F - 32)

Temperature in °F = (1.8 x temperature in °C) + 32

Distance

Millimeters = 25.4 x inches

Pressure

Millibars = 33.86 x inches of mercury

Kilopascals = 3.386 x inches of mercury

Pounds per square inch = 0.49 x inches of mercury

Standard atmospheres = 0.0334 x inches of mercury

Tables and Formulas

Wind Chill Chart

Wind (MPH)	Temperature in °F														
	70	**60**	**50**	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**	**-70**
5	69	58	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68	-78
10	65	53	41	28	16	4	-9	-21	-33	-46	-58	-70	-82	-95	-107
15	63	49	36	22	9	-4	-18	-31	-45	-58	-72	-85	-98	-112	-125
20	61	47	33	18	4	-10	-24	-39	-53	-67	-81	-95	-110	-124	-138
25	60	45	30	15	1	-14	-29	-44	-59	-73	-88	-103	-118	-133	-147
30	59	44	28	13	-2	-17	-32	-48	-63	-78	-93	-109	-124	-139	-154
35	58	43	27	12	-4	-19	-35	-51	-66	-82	-97	-113	-128	-144	-159
40	58	42	26	10	-5	-21	-37	-53	-68	-84	-100	-116	-131	-147	-163
45	57	42	26	10	-6	-22	-38	-54	-70	-86	-101	-117	-133	-149	-165
50	57	41	25	9	-7	-23	-39	-55	-71	-86	-102	-118	-134	-150	-166
55	57	41	25	9	-7	-23	-39	-55	-71	-87	-103	-119	-135	-151	-167
60	57	41	25	9	-7	-23	-39	-55	-71	-87	-102	-118	-134	-150	-166
65	57	41	26	10	-6	-22	-38	-54	-70	-86	-102	-118	-134	-149	-165
70	58	42	26	10	-6	-21	-37	-53	-69	-85	-101	-116	-132	-148	-164

Wind Chill Equation

WC = 91.4 - ((0.474677 - (0.020425 * V) + (0.303107 * SQRT(V))) * (91.4-T))

Where:

WC = wind chill temperature

V = wind velocity in mph

T = air temperature in °F

Heat Index

	Temperature in °F													
RH	70	75	80	85	90	95	100	105	110	115	120	125	130	135
0	64	66	73	78	83	87	91	95	99	103	107	111	117	120
5	64	69	74	79	84	88	93	97	102	107	111	116	122	126
10	65	70	75	80	85	90	95	100	105	111	116	123	131	
15	65	71	76	81	86	91	97	102	108	115	123	131		
20	66	72	77	82	87	93	99	105	112	120	130	141		
25	66	72	77	83	88	94	101	109	117	127	139			
30	67	73	78	84	90	96	104	113	123	135	148			
35	67	73	79	85	91	98	107	118	130	143				
40	68	74	79	86	93	101	110	123	137	151				
45	68	74	80	87	95	104	115	129	143					
50	69	75	81	88	96	107	120	135	150					
55	69	75	81	89	98	110	126	142						
60	70	76	82	90	100	114	132	149						
65	70	76	83	91	102	119	138							
70	70	77	84	93	106	124	144							
75	70	77	85	95	109	130	150							
80	71	78	86	97	113	136								
85	71	78	87	99	117	140								
90	71	79	88	102	122	150								
95	71	79	89	105	126									
100	72	80	90	108	131									

Dew Point

B = (ln (RH/100) + ((17.2694*T) / (238.3+T))) / 17.2694

Dew Point in °C = (238.3 * B) / (1-B)

Where:

RH = Relative Humidity

T = Temperature in °C

Ln = Natural logarithm

Columbia Weather Systems, Inc.
2240 NE Griffin Oaks Street, Suite 100
Hillsboro, OR 97124-6463

Telephone
(503) 629-0887

Fax
(503) 629-0898

Web Site
http://www.columbiaweather.com

Email
info@columbiaweather.com

Catalog Number: 81642

Version 1.10

Printed in U.S.A.