



# Weather MicroServer™

## User Manual



# **Weather MicroServer™**

## **User Manual**

Version 2.00

All specifications subject to change without notice.

Printed in U. S. A.

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# Welcome!

Welcome to the Columbia Weather Systems family of users and congratulations on your purchase of the Weather MicroServer.

**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 Weather MicroServer is a small board computer 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 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 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.

## ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. The Weather MicroServer is adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

1. Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself with a wrist strap and a resistive connection cord to the equipment chassis before touching the boards. When neither of the above is possible, at least touch a conductive part of the equipment chassis with your other hand before touching the boards.
2. Always hold the boards by the edges and avoid touching the component contacts.

# Table of Contents

|   |           |
|---|-----------|
| <b>WELCOME!</b> .....                                       | <b>3</b>  |
| <b>IMPORTANT NOTICE: SHIPPING DAMAGE</b> .....              | <b>5</b>  |
| ESD PROTECTION .....  | 6         |
| <b>SECTION 1: INTRODUCTION</b> .....                        | <b>11</b> |
| THE WEATHER MICROSERVER .....                               | 11        |
| MEASUREMENTS AND CALCULATIONS .....                         | 12        |
| <i>Wind Speed and Direction Parameters</i> .....            | 12        |
| <i>Precipitation Parameters</i> .....                       | 12        |
| <i>Relative Humidity Parameter</i> .....                    | 12        |
| <i>Solar Radiation Parameter</i> .....                      | 12        |
| <i>Temperature Parameters</i> .....                         | 12        |
| <i>Barometric Pressure Parameters</i> .....                 | 13        |
| <i>Calculated Parameters</i> .....                          | 13        |
| <i>Air Quality Parameters</i> .....                         | 13        |
| <i>Visibility</i> .....                                     | 13        |
| SPECIFICATIONS .....  | 13        |
| <b>SECTION 2: INSTALLATION</b> .....                        | <b>15</b> |
| SYSTEM CONFIGURATION .....                                  | 15        |
| <i>Orion Weather Station Interface</i> .....                | 15        |
| <i>Magellan Weather Station Interface</i> .....             | 16        |
| <i>Capricorn 2000 Weather Station Interface</i> .....       | 16        |
| <i>Pegasus Weather Stations Interface</i> .....             | 16        |
| <i>Orion LT Interface</i> .....                             | 16        |
| <i>Visibility Sensor Interface</i> .....                    | 17        |
| <i>Solar Radiation Sensor (Pyranometer) Interface</i> ..... | 17        |
| <b>SECTION 3: OPERATION</b> .....                           | <b>19</b> |
| WEATHER MICROSERVER USER INTERFACE .....                    | 19        |
| HOME PAGE .....   | 20        |
| <i>Shutdown</i> .....                                       | 20        |
| REALTIME DISPLAY .....                                      | 21        |
| LATEST MEASUREMENTS .....                                   | 21        |
| MEASUREMENTS DEFINITION .....                               | 23        |
| NETWORK SETUP .....   | 31        |
| CHANGE PASSWORD .....                                       | 32        |
| DATE AND TIME .....   | 32        |
| DATA OUTPUT .....   | 33        |
| <i>Station Name</i> .....                                   | 33        |
| <i>COM1 (Primary Input)</i> .....                           | 33        |



|   |    |
|---|----|
| <i>COM2</i> .....                               | 33 |
| <i>COM3</i> .....                               | 34 |
| <i>Solar Radiation Input:</i> .....             | 34 |
| <i>Weather Underground Output:</i> .....        | 34 |
| <i>CWOP Output</i> .....                        | 34 |
| <i>FTP Output</i> .....                         | 34 |
| <i>Diagnostic Logging</i> .....                 | 35 |
| SNMP OUTPUT.....                                | 35 |
| MODBUS OUTPUT .....                             | 35 |
| MODBUS POINT LIST (32-BIT).....                 | 36 |
| MODBUS POINT LIST (16-BIT SCALED INTEGERS)..... | 36 |
| DATA LOGS .....                                 | 37 |
| CONFIGURATION FILE.....                         | 38 |
| SELECT MEASUREMENTS .....                       | 39 |
| UNITS .....                                     | 40 |
| PARAMETER SETTINGS .....                        | 40 |
| FIRMWARE UPDATE.....                            | 41 |
| DIAGNOSTICS.....                                | 42 |
| <i>Start Data Manager</i> .....                 | 42 |
| <i>Stop Data Manager</i> .....                  | 42 |
| <i>Restart Data Manager</i> .....               | 42 |
| <i>Reboot</i> .....                             | 42 |
| XML WEB SERVER .....                            | 43 |

## **SECTION 4: USER SUPPORT INFORMATION .....47**

|                                   |    |
|-----------------------------------|----|
| LIMITED WARRANTY .....            | 47 |
| <i>EXCLUSIONS</i> .....           | 47 |
| RETURN FOR REPAIR PROCEDURE ..... | 48 |

## **REFERENCE .....51**

|   |    |
|---|----|
| GLOSSARY .....                            | 51 |
| <i>Aspirating Radiation Shield</i> .....  | 51 |
| <i>Barometric Pressure</i> .....          | 51 |
| <i>Celsius Temperature Scale</i> .....    | 51 |
| <i>Dew Point</i> .....                    | 51 |
| <i>Fahrenheit Temperature Scale</i> ..... | 51 |
| <i>Heat Index</i> .....                   | 51 |
| <i>Relative Humidity</i> .....            | 52 |
| <i>Sea Level Pressure</i> .....           | 52 |
| <i>Wind Chill</i> .....                   | 52 |
| UNIT CONVERSION .....                     | 53 |
| <i>Speed</i> .....                        | 53 |
| <i>Temperature</i> .....                  | 53 |
| <i>Distance</i> .....                     | 53 |
| <i>Pressure</i> .....                     | 53 |
| TABLES AND FORMULAS.....                  | 54 |

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|                                  |    |
|----------------------------------|----|
| <i>Wind Chill Chart</i> .....    | 54 |
| <i>Wind Chill Equation</i> ..... | 55 |
| <i>Heat Index</i> .....          | 56 |
| <i>Dew Point</i> .....           | 57 |



# SECTION 1: INTRODUCTION

## The Weather MicroServer



No longer does weather station connectivity require a dedicated computer with its requisite maintenance, virus-protection and operating system upgrades. The Weather MicroServer is a self-contained, proprietary system utilizing the Linux operating system.

The Weather MicroServer creates an “Internet-ready” weather monitoring system by automatically providing FTP output, XML web service, and Internet browser user interface. FTP output includes XML, CSV, and CSV append formats.

SNMP and Modbus/TCP communication protocols are standard for Industrial Management applications.

The Weather MicroServer has data logging capability. It connects to your network with an included Ethernet cable. Two serial ports offer interface to both the Weather Display Console and additional peripheral devices or sensors.

The Weather MicroServer includes an automatic data output to the Weather Underground and the Citizen Weather Observer Program (CWOP).

The Weather MicroServer can provide real-time weather data to WeatherMaster Software over the network. This allows users to simultaneously monitor the weather using WeatherMaster on any computer connected to the network.

The Weather MicroServer interfaces with any Capricorn 2000, Pegasus, Magellan or Orion weather station to provide a range of weather parameters and monitoring options, including portable and vehicle-mount sensor packages.

## **Measurements and Calculations**

### **Wind Speed and Direction Parameters**

(Two sensors are available)

- Wind Speed
- Raw Wind Direction
- Adjusted Wind Direction
- 3 Second Rolling Average Wind Speed
- 3 Second Rolling Average Wind Direction
- 2 Minute Rolling Average Wind Speed
- 2 Minute Rolling Average Wind Direction
- 10 Minute Rolling Average Wind Speed
- 10 Minute Rolling Average Wind Direction
- 10 Minute Gust Wind Direction
- 10 Minute Gust Wind Speed
- 10 Minute Gust Time
- 60 Minute Gust Wind Direction
- 60 Minute Gust Wind Speed
- 60 Minute Gust Time

### **Precipitation Parameters**

- Rain Today
- Rain this week
- Rain this month
- Rain this year
- Rain Rate
- Hail Today\*
- Hail Rate\*

### **Relative Humidity Parameter**

- Relative Humidity

### **Solar Radiation Parameter**

- Solar Radiation

### **Temperature Parameters**

- Temperature 1
- Temperature 2\*\*

- Temperature 3\*\*
- Temperature 4\*\*
- Average Temperature Today
- Degree Days

## Barometric Pressure Parameters

- Raw Barometric Pressure
- Adjusted Barometric Pressure

## Calculated Parameters

- Wind Chill
- Heat Index
- Dew Point
- Density Altitude
- Wet Bulb Temperature

## Air Quality Parameters

- Wet Bulb Globe Temperature
- Wet Bulb Temperature
- Saturated Vapor Pressure
- Vapor Pressure
- Dry Air Pressure
- Dry Air Density
- Wet Air Density
- Absolute Humidity
- Air Density Ratio
- Adjusted Altitude
- SAE Correction Factor

## Visibility

- Visibility
- Lux
- Extinction Coefficient

## Specifications

- 200 MHz ARM9 Processor
- 32 MB SDRAM
- 512 MB Flash Memory
- 3 Serial Communication Ports
- 1 Ethernet Port
- Linux Operating System
- Indoor Enclosure Dimensions: 6.40" W x 2.60" H x 5.40" D

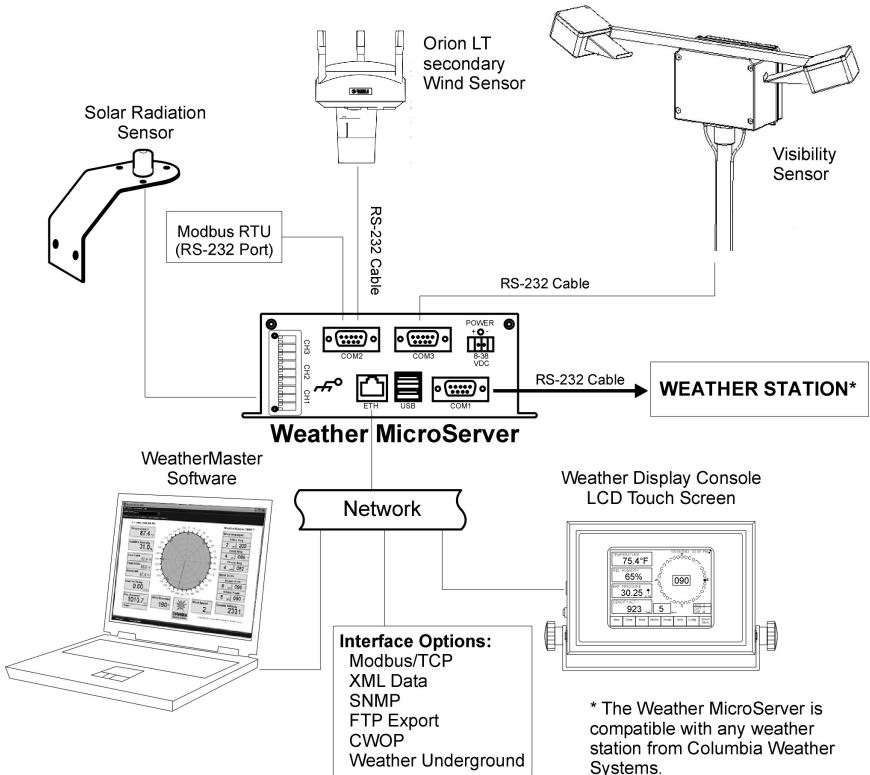
\* Available with Orion Weather Stations only

\*\* Available with Capricorn/Pegasus Weather Stations only

# SECTION 2: INSTALLATION

## System Configuration

The Weather MicroServer is designed to receive weather data input from any Orion, Magellan, Capricorn or Pegasus weather station.



## Orion Weather Station Interface

The Orion Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Orion Interface Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Output page, select "Input Orion Data" under COM1 field.



## **Magellan Weather Station Interface**

The Magellan Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the Magellan Interface Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Output page, select "Input All-In-One Data" under COM1 field.

## **Capricorn 2000 Weather Station Interface**

The Capricorn 2000 Weather Station connects to COM1 of the MicroServer using an RS-232 cable or a wireless link.

For a direct cabled connection, COM1 of the MicroServer connects to the "Modem Serial" port on the Capricorn Control Module using an RS-232 cable provided with the station.

For a wireless connection, COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Output page, select "Input Capricorn Data" under COM1 field.

## **Pegasus Weather Stations Interface**

The Pegasus Weather Station connects to COM1 of the MicroServer using only a wireless link.

COM1 of the MicroServer connects to the client wireless transceiver using an RS-232 cable provided with the transceiver.

In the user interface, Data Output page, select "Input Capricorn Data" under COM1 field.

## **Orion LT Interface**

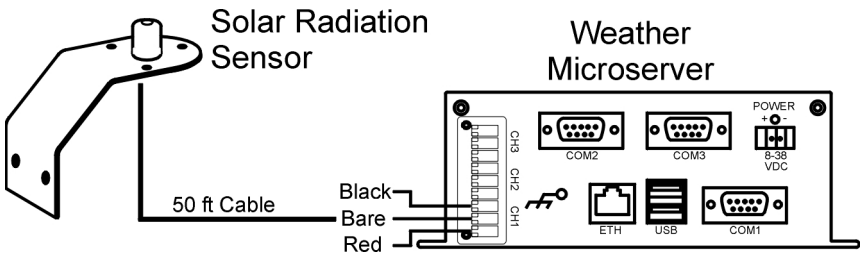
An Orion LT can be connected to COM2 as a secondary wind sensor. The wind speed and direction parameters will be displayed with the number "2" after each parameter.

## Visibility Sensor Interface

A visibility sensor can be connected to COM3 to provide visibility data. The MicroServer will display three parameters: visibility, extinction coefficient, and lux (if a photo sensor is included).

## Solar Radiation Sensor (Pyranometer) Interface

A solar radiation sensor can be connected to channel one on the MicroServer as shown below:





# Section 3: Operation

## Weather MicroServer User Interface

The Weather MicroServer utilizes a browser user interface. The MicroServer is configured at the factory with IP address 192.168.0.50.

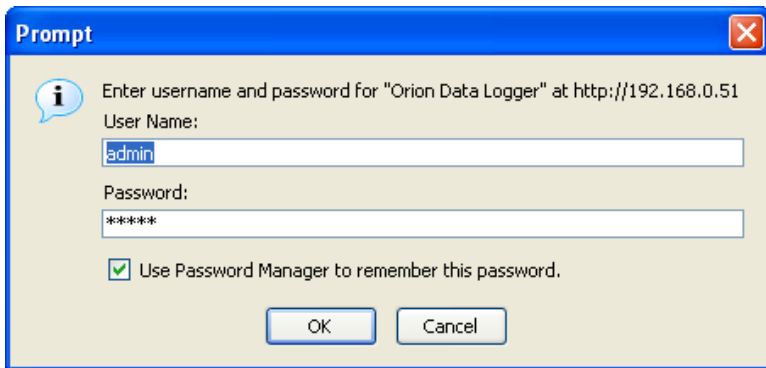
The IP address along with other network settings can be changed to match the local network configuration. Please see Network Setup for more information.

Once the MicroServer is connected to the network, open an Internet browser such as Internet Explorer and type in the following address:

http://192.168.0.50

If this IP address is already being used by another device, contact customer support for more instructions.

When the User Interface is accessed, the user will be prompted to enter a user name and password.



The default user name is **admin** and the default password is also **admin**.

If the password has been changed and lost, please contact Columbia Weather Systems for assistance.

## Home Page

**Weather Microserver**

Station Name: 51 Orion LX

Firmware Version: 1.00.1195 [2008-07-14 21:56:09]

Current Time: 2008-07-21 09:53:09

Serial Number:

Status: Running

The Home page is an informational page that includes the station name, firmware version, current time, serial number, and status.

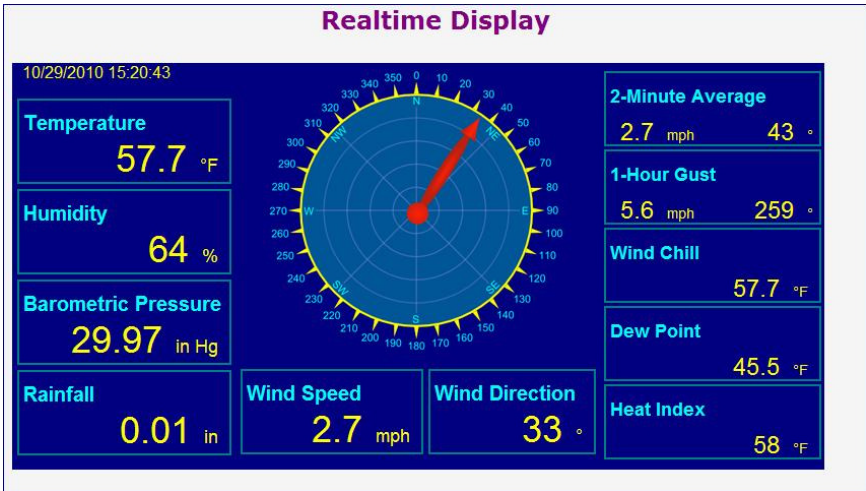
The displayed time is the time generated by the real-time clock in the MicroServer. Be sure to refresh the browser for the current time.

The MicroServer status is Running or Stopped. The Data Manager software starts automatically on power up.

### Shutdown

Click on the Shutdown button to stop the software and User Interface. There will be no access to the User Interface after this button is clicked. To restart the program, cycle the power on the MicroServer, and the User Interface can be accessed.

# Realtime Display



The Realtime Display screen displays the main parameters in the selected units.

To view the Realtime Display screen without access to the admin password and the menu links in the user interface, browse the following address:

<http://192.168.0.50/mainreadouts.php>

Note: please enter your own IP address if it has been changed from the 192.168.0.50 default.

## Latest Measurements

| <b>Latest Measurements</b>                |                   |
|---|-------------------|
| Sample Timestamp:                         | 10/20/06 16:46:24 |
| Instantaneous Wind Direction:             | 12                |
| Peak Windspeed:                           | 4.7               |
| Average Windspeed:                        | 3.7               |
| Average Wind Direction at Peak:           | 0                 |
| 3 Second Rolling Average Wind Speed:      | 3.75              |
| 3 Second Rolling Average Wind Direction:  | 9.999466          |
| 2 Minute Rolling Average Wind Speed:      | 5.086885          |
| 2 Minute Rolling Average Wind Direction:  | 36.025563         |
| 10 Minute Rolling Average Wind Speed:     | 5.02504           |
| 10 Minute Rolling Average Wind Direction: | 32.068646         |
| Temperature 1:                            | 57.5              |
| Relative Humidity:                        | 59.3              |

The Latest Measurements page displays the current parameter values in the selected units. Refreshing the browser will update the readings as needed.

Only the selected parameters in the Select Measurements page will be displayed.

To view the Latest Measurements screen without access to the admin password and the menu links in the user interface, browse the following address:

<http://192.168.0.50/latestmeasurements.php>

Note: please enter your own IP address if it has been changed from the 192.168.0.50 default.

---

# Measurements Definition

## Sample Timestamp

Definition: Time and date of measurement

XML parameter: mtSampTime

## Windspeed

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtWindspeed

Units: MPH

## Raw Wind Direction

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtRawWindDir

Units: Degrees

## Adjusted Wind Direction

Definition: Raw wind direction corrected for North

XML parameter: mtAdjWindDir

Units: Degrees

## 3 Second Rolling Average Wind Speed

Definition: 3 second rolling average of wind speed reading

XML parameter: mt3SecRollAvgWindSpeed

Units: MPH

## 3 Second Rolling Average Wind Direction

Definition: 3 second rolling average of adjusted wind direction reading

XML parameter: mt3SecRollAvgWindDir

Units: Degrees

## 2 Minute Rolling Average Wind Speed

Definition: 2 minute rolling average of wind speed reading

XML parameter: mt2MinRollAvgWindSpeed

Units: MPH

## 2 Minute Rolling Average Wind Direction

Definition: 2 minute rolling average of adjusted wind direction reading

XML parameter: mt2MinRollAvgWindDir

Units: Degrees

## 10 Minute Rolling Average Wind Speed

Definition: 10 minute rolling average of wind speed reading

XML parameter: mt10MinRollAvgWindSpeed

Units: MPH



**10 Minute Rolling Average Wind Direction**

Definition: 10 minute rolling average of adjusted wind direction reading

XML parameter: mt10MinRollAvgWindDir

Units: Degrees

**10 Minute Gust Wind Direction**

Definition: 10 minute rolling wind direction at maximum wind speed.

XML parameter: mt10MinWindGustDir

Units: MPH

**10 Minute Gust Wind Speed**

Definition: 10 minute rolling maximum wind speed.

XML parameter: mt10MinWindGustSpeed

Units: MPH

**10 Minute Gust Time**

Definition: Gust time stamp during the last 10 minutes.

XML parameter: mt10MinWindGustTime

Units: date and time

**60 Minute Gust Wind Direction**

Definition: 60 minute rolling wind direction at maximum wind speed.

XML parameter: mt60MinWindGustDir

Units: MPH

**60 Minute Gust Wind Speed**

Definition: 60 minute rolling maximum wind speed.

XML parameter: mt60MinWindGustSpeed

Units: MPH

**60 Minute Gust Time**

Definition: Gust time stamp during the last 60 minutes.

XML parameter: mt60MinWindGustTime

Units: date and time

**Temperature 1**

Definition: One second temperature reading

XML parameter: mtTemp1

Units: °F

**Temperature 2**

Definition: One second temperature reading (Capricorn/Pegasus only)

XML parameter: mtTemp1

Units: °F

**Temperature 3**

---

Definition: One second temperature reading (Capricorn/Pegasus only)

XML parameter: mtTemp1

Units: °F

### **Temperature 4**

Definition: One second temperature reading (Capricorn/Pegasus only)

XML parameter: mtTemp1

Units: °F

### **Relative Humidity**

Definition: One second relative humidity reading

XML parameter: mtRelHumidity

Units: %

### **Solar Radiation**

Definition: One second relative humidity reading (Capricorn/Pegasus only)

XML parameter: mtSolarRadiation

Units: W/m-2

### **Wind Chill**

Definition: Calculated using temperature 1 and wind speed.

XML parameter: mtWindChill

Units: °F

### **Heat Index**

Definition: Calculated using temperature 1 and relative humidity

XML parameter: mtHeatIndex

Units: °F

### **Dew Point**

Definition: Calculated using temperature 1 and relative humidity

XML parameter: mtDewPoint

Units: °F

### **Degree Days:**

Definition: Calculated using temperature 1

XML parameter: mtDegreeDay

Units: °F

### **Average Temperature Today**

Definition: Calculated using temperature 1

XML parameter: mtAvgTempToday

Units: °F

### **Degree Day Start**

Definition: Start date for degree day calculation

XML parameter: mtDegreeDayStart

### **Raw Barometric Pressure**

Definition: One second barometric pressure reading

XML parameter: mtRawBaromPress

Units: Inches Hg

### **Adjusted Barometric Pressure**

Definition: Raw barometric pressure with altitude and offset applied

XML parameter: mtAdjBaromPress

Units: Inches Hg

### **Density Altitude**

Definition: Calculated using adjusted barometric pressure, temperature 1, relative humidity and altitude.

XML parameter: mtDensityAltitude

Units: Feet

### **Wet Bulb Globe Temperature**

Definition: A composite temperature used to estimate the effect of temperature, humidity, and solar radiation on humans. The MicroServer uses an approximation formula.

XML parameter: mtWetBulbGlobeTemp

Units: °F

### **Wet Bulb Temperature**

Definition: Wet bulb temperature derived using a look up table of temperature and relative humidity.

XML parameter: mtWetBulbTemp

Units: °F

### **Saturated Vapor Pressure**

Definition: The pressure of a vapor in equilibrium with its non-vapor phases when air is saturated with water vapor.

XML parameter: mtSaturatedVaporPressure

Units: Inches Hg

### **Vapor Pressure**

Definition: The pressure of a vapor in equilibrium with its non-vapor phases.

XML parameter: mtVaporPressure

Units: Inches Hg

### **Dry Air Pressure**

Definition: Barometric pressure minus vapor pressure.

XML parameter: mtDryAirPressure

---

Units: Inches Hg

**Dry Air Density**

Definition: The air's density depending on temperature and pressure.

XML parameter: mtDryAirDensity

Units: lbm/ft<sup>3</sup>

**Wet Air Density**

Definition: The air's density depending on temperature, humidity, and pressure.

XML parameter: mtWetAirDensity

Units: lbm/ft<sup>3</sup>

**Absolute Humidity**

Definition: Actual amount of water vapor in the air.

XML parameter: mtAbsoluteHumidity

Units: lbm/ft<sup>3</sup>

**Air Density Ratio**

Definition: Dry air density with the added effect of water vapor displacement of oxygen.

XML parameter: mtAirDensityRatio

Units: %

**Adjusted Altitude**

Definition: Calculated using dry air density. Used for horsepower correction and prediction of vehicle performance.

XML parameter: mtAdjustedAltitude

Units: Feet

**SAE Correction Factor**

Definition: Society of Automotive Engineers (SAE) calculation using temperature, pressure, and vapor pressure

XML parameter: mtSAECorrectionFactor

Units: none

**Rain Today**

Definition: Accumulated rain for the day in 0.01 inches increments

XML parameter: mtRainToday

Units: Inches

**Rain this week**

Definition: Accumulated rain for the week

XML parameter: mtRainThisWeek

Units: Inches

**Rain this month**

Definition: Accumulated rain for the month

XML parameter: mtRainThisMonth

Units: Inches

### **Rain this year**

Definition: Accumulated rain for the year

XML parameter: mtRainThisYear

Units: Inches

### **Rain Rate**

Definition: Running 5-minute rain rate

XML parameter: mtRainRate

Units: Inches/Hour

### **Hail Today**

Definition: Cumulative amount of hits against collecting surface for the day

XML parameter: mtHailToday

Units: Hits/in<sup>2</sup>

### **Hail Rate**

Definition: Running 5-minute hail rate

XML parameter: mtHailRate

Units: Hits/in<sup>2</sup>/hour

### **Extinction Coefficient**

Definition: Fraction of light lost to scattering and absorption

XML parameter: mtExtinctionCoefficient

Units: km<sup>-1</sup>

### **Visibility**

Definition: Visibility

XML parameter: mtVisibility

Units: miles

### **Lux**

Definition: Day/Night meter

XML parameter: mtLux

Units: Lux

### **Windspeed – Sensor 2**

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtWindspeed\_2

Units: MPH

### **Raw Wind Direction – Sensor 2**

---

Definition: 3 second rolling average of 250 millisecond samples

XML parameter: mtRawWindDir

Units: Degrees

### **Adjusted Wind Direction – Sensor 2**

Definition: Raw wind direction corrected for North

XML parameter: mtAdjWindDir\_2

Units: Degrees

### **3 Second Rolling Average Wind Speed – Sensor 2**

Definition: 3 second rolling average of wind speed reading

XML parameter: mt3SecRollAvgWindSpeed\_2

Units: MPH

### **3 Second Rolling Average Wind Direction – Sensor 2**

Definition: 3 second rolling average of adjusted wind direction reading

XML parameter: mt3SecRollAvgWindDir\_2

Units: Degrees

### **2 Minute Rolling Average Wind Speed – Sensor 2**

Definition: 2 minute rolling average of wind speed reading

XML parameter: mt2MinRollAvgWindSpeed\_2

Units: MPH

### **2 Minute Rolling Average Wind Direction – Sensor 2**

Definition: 2 minute rolling average of adjusted wind direction reading

XML parameter: mt2MinRollAvgWindDir\_2

Units: Degrees

### **10 Minute Rolling Average Wind Speed – Sensor 2**

Definition: 10 minute rolling average of wind speed reading

XML parameter: mt10MinRollAvgWindSpeed\_2

Units: MPH

### **10 Minute Rolling Average Wind Direction – Sensor 2**

Definition: 10 minute rolling average of adjusted wind direction reading

XML parameter: mt10MinRollAvgWindDir\_2

Units: Degrees

### **10 Minute Gust Wind Direction – Sensor 2**

Definition: 10 minute rolling wind direction at maximum wind speed.

XML parameter: mt10MinWindGustDir\_2

Units: MPH

### **10 Minute Gust Wind Speed – Sensor 2**

Definition: 10 minute rolling maximum wind speed.

XML parameter: mt10MinWindGustSpeed\_2

Units: MPH

**10 Minute Gust Time – Sensor 2**

Definition: Gust time stamp during the last 10 minutes.

XML parameter: mt10MinWindGustTime\_2

Units: date and time

**60 Minute Gust Wind Direction – Sensor 2**

Definition: 60 minute rolling wind direction at maximum wind speed.

XML parameter: mt60MinWindGustDir\_2

Units: MPH

**60 Minute Gust Wind Speed – Sensor 2**

Definition: 60 minute rolling maximum wind speed.

XML parameter: mt60MinWindGustSpeed\_2

Units: MPH

**60 Minute Gust Time – Sensor 2**

Definition: Gust time stamp during the last 60 minutes.

XML parameter: mt60MinWindGustTime\_2

Units: date and time

# Network Setup

## Network Setup

|              |  |
|--------------|--|
| IP Address:  | <input type="text" value="192.168.0.50"/>  |
| Subnet Mask: | <input type="text" value="255.255.255.0"/> |
| Gateway:     | <input type="text" value="192.168.0.1"/>   |
| DNS Server:  | <input type="text" value="192.168.0.1"/>   |

Network Setup page allows the user to change the IP address, subnet mask, gateway, and DNS Server settings.

The MicroServer factory settings are as follows:

IP address 192.168.0.50

Subnet Mask: 255.255.255.0

Gateway: 192.168.0.1

DNS Server: 192.168.0.1

If the network subnet mask, gateway or DNS server settings are other than above, the MicroServer settings must be changed to match the network in order for the MicroServer to be visible on the network.

To change the MicroServer network settings:

1. Connect the MicroServer to a stand-alone computer (not connected to the network) via a standard or a crossover Ethernet cable.
2. Change the computer network settings to match the MicroServer settings shown above with the exception of the IP address. Use IP address 195.168.0.51 for the computer. Contact Network Administrator for assistance.
3. Browse the MicroServer at <http://192.168.0.50>
4. In the MicroServer User Interface, click on Network Setup and change the settings to match your network.
5. Click on Apply Changes.
6. Disconnect the MicroServer from the stand-alone computer and connect it to the network using a regular Ethernet cable.
7. Browse the MicroServer from the network to verify that the changes are successful.
8. Change the computer network settings to original settings.



## Change Password

### Change Password

Admin password:

Re-enter password:

Change Password page allows the user to change the Admin password.

## Date and Time

### Set Date and Time

Current Date and Time: 2006-10-30 15:50:57

Date (yyyy-mm-dd):

Time (hh:mm:ss)

Date and Time page allows the user to change the MicroServer date and time.

The MicroServer date and time is used to date and time stamp all measurements.

## Data Output

### Data Output

Station Name:

COM1 (Primary Input):

COM2:

COM3:

Solar Radiation Input:

Weather Underground Output:

CWOP Output:

FTP Output:

FTP URL:

FTP user:

FTP password:

Output Format:

Diagnostic Logging :

SNMP Output:  [Show MIB file](#)

Modbus Settings: TCP:1

The Data Output page allows the user to configure the type and location of data output and to set the station type.

### Station Name

Change the station name, to reflect the station location, company name or function.

The station name will be displayed on the browser top bar.

### COM1 (Primary Input)

Select “Input Orion Data” if connected to an Orion Weather Station.

Select “Input Capricorn Data” if connected to either a Capricorn or Pegasus Weather Station.

Select “Input All-In-One Data” if connected to a Magellan Weather Station.

### COM2

To output the adjusted raw sensor data on serial port 2 to other devices such as the LCD Display Console, select “Output adjusted COM1 data.”

To interface a second wind sensor, select “Input from Wind-only sensor.”

Otherwise, select “--.”

## COM3

Select "Input TNT Compass data" if an electronic compass is connected to the MicroServer.

Select "Input Visibility data" if a visibility sensor is connected to the MicroServer.

Otherwise, select "No Input."

## Solar Radiation Input:

Select "Enabled" if a solar radiation sensor is connected directly to the solar channel on the MicroServer, otherwise, select "Disabled."

## Weather Underground Output:

To upload the weather data to the Weather Underground, please go to: [www.wunderground.com](http://www.wunderground.com), register (create a password and handle) and add a station (create a Station ID).

To output weather data to the Weather Underground network, select "Enabled", otherwise, select "Disabled."

Click on Settings to configure the output. Enter the Weather Station ID and Password and click OK.

## CWOP Output

To upload the weather data to the Citizen Weather Observer Program (CWOP), please go to <http://www.wxqa.com/> to setup a Call Sign/Station ID and Password.

To output weather data to CWOP, select "Enabled", otherwise, select "Disabled."

Click on Settings to configure the output.

Enter the Call Sign/Station ID assigned by CWOP.

Enter **cwop.aprs.net** for the Server.

Enter **14580** for the Port.

The Password should be blank.

Click OK and then Apply Changes.

## FTP Output

The FTP output enables the MicroServer to send weather data files to FTP servers over the Internet.

Enter the FTP URL, user, and password.

---

The URL (Uniform Resource Locator) is the FTP server address or name and it should end in *filename*

*Filename:* The file name that will be uploaded to the FTP server with the proper extension. If the output format is XML, the extension is .xml. If the output is CSV, the extension is .csv or .txt.

Chose the output format desired. The output format is dependent on how the data is going to be used at the FTP server.

XML (Extensible Markup Language) is a data description file that also contains the data. The XML file will contain the current measurements. This format is useful for generating web pages containing weather data and for interfacing with other software programs.

CSV (comma-separated values) file contains the data separated by commas. The field order in the record is based on the same order of the selected measurements in the Select Measurements page. Two output formats are available:

CSV-append data format will generate a file with comma-separated records every 15 seconds without overwriting the previous data.

CSV-overwrite data format will generate a file with one (the latest) comma-separated record. This file will update every 15 seconds and overwrite the previous record.

## **Diagnostic Logging**

Is set to Verbose Logging by default. The diagnostic logging is used by Customer Service to troubleshoot problems with the MicroServer.

## **SNMP Output**

SNMP: Simple Network Management Protocol. The Weather MicroServer has a built-in SNMP interface for communication with network management systems.

Click on Show MIB file to view the MIB definitions and objects for the MicroServer.

## **Modbus Output**

The Weather MicroServer has a built-in Modbus TCP/IP, RTU, and ASCII slave interface for communication with industrial automation systems and OPC servers.

For Modbus configuration, click on the Settings button.

For Modbus RTU, select "Serial (COM2) RTU."

Enter the Modbus address, baud rate, and parity. The databits is set to 8 and the stopbits is set to 1.

For Modbus ASCII, select “Serial (COM2) ASCII.”

Enter the Modbus address, baud rate, and parity. The Databits is set to 8 and the Stopbits is set to 1.

For Modbus TCP/IP, select “TCP.”

Enter the Modbus address.

If changes are made, click on Apply Changes.

The MicroServer offers both 32-bit and 16-bit scaled integer registers.

A complete point list is available at:

<http://www.columbiaweather.com/OrionModbusData.pdf>

### **Modbus Point List (32-bit)**

All data is accessed via read only input registers [Modbus Function Code 3]

Data type Long = Signed 32 bit value

Data type Float = 32 bit floating point value

For each of the available measurements, the two registers immediately following the value contain the posix time value of the time that value was last updated. For example: the wind speed value is stored in registers 5 and 6. The last update timestamp is stored in registers 7 and 8 and is a 32-bit integer value.

The posix time values are 32-bit integers; all the values are Modbus input registers.

### **Modbus Point List (16-bit Scaled Integers)**

The 16-bit scaled integer registers are available for most parameters.

The 16-bit point list includes a minimum, maximum, factor, and offset value for each parameter.

Parameter value = (Scaled Integer + Offset)/Factor

## Data Logs

### Data Log Files

- ◆ [dirsnapshot0724.txt](#)
- ◆ [20080207-000005.txt](#)
- ◆ [20080206-000041.txt](#)
- ◆ [20080205-000018.txt](#)
- ◆ [20080204-000035.txt](#)
- ◆ [20080203-000025.txt](#)
- ◆ [20080202-000003.txt](#)
- ◆ [20080201-000056.txt](#)
- ◆ [20080131-000013.txt](#)
- ◆ [20080130-000016.txt](#)
- ◆ [20080129-000054.txt](#)
- ◆ [20080128-000053.txt](#)
- ◆ [20080127-000052.txt](#)
- ◆ [20080126-000035.txt](#)

The Weather MicroServer automatically saves a complete record of all the selected parameters every minute. The data is saved in a daily record. If a change is made to the list of selected parameters, a new file for the day is generated.

The Data Log files are comma delimited text files. Each file has a header with all the parameter names.

The data log file names are based on year-month-day-time format.

The MicroServer stores approximately three months worth of data. When data log memory is full, the oldest file is deleted as the new file is stored.

## Configuration File

### Configuration File

```

<config>
  <LogfileName>C:/projects/orion/release/oriondm.log</LogfileName>
  <StateSaveInterval>60</StateSaveInterval>
  <outputs>
    <output>
      <outputType>CCME</outputType>
      <serialportname>/dev/ttyTS0</serialportname>
    </output>
    <output>
      <outputType>FTP</outputType>
      <OutputUrl>ftp://www.columbiaweather.com/oriontest.xml</OutputUrl>
      <FTPusername>weather</FTPusername>
      <FTPPassword>weather7</FTPPassword>
      <OutputFormat>XML</OutputFormat>
    </output>
    <output>
      <outputType>FILE</outputType>
      <OutputUrl>/var/tmp/latestsampledata.php</OutputUrl>
      <OutputFormat>PHP</OutputFormat>
    </output>
    <output>
      <outputType>FILE</outputType>
      <WriteInterval>1</WriteInterval>
      <OutputUrl>/var/tmp/latestsampledata.xml</OutputUrl>
      <OutputFormat>XML</OutputFormat>
    </output>
  </outputs>
  <inputs>
    <input>
      <command>wxtidi --serialinput /dev/ttyAM0 --serialecho
/dev/ttyAM1</command>

```

The Configuration File page displays the configuration file and allows the user to edit and apply changes.

All User Interface configurations are stored in this file.

Changes to the configuration file should be reserved for advanced users and customer service.

If the file has been inadvertently changed, the Restore Defaults button will load the factory default file.

## Select Measurements

### Selected Measurements

- Wind Speed
- Raw Wind Direction
- Adjusted Wind Direction
- 3 Second Rolling Average Wind Speed
- 3 Second Rolling Average Wind Direction
- 2 Minute Rolling Average Wind Speed
- 2 Minute Rolling Average Wind Direction
- 10 Minute Rolling Average Wind Speed
- 10 Minute Rolling Average Wind Direction
- 10 Minute Gust Wind Direction
- 10 Minute Gust Wind Speed
- 10 Minute Gust Time
- 60 Minute Gust Wind Direction
- 60 Minute Gust Wind Speed
- 60 Minute Gust Time
- Temperature 1
- Temperature 2
- Temperature 3
- Temperature 4
- Relative Humidity
- Solar Radiation
- Wind Chill
- Heat Index
- Dew Point
- Degree Days
- Average Temperature Today
- Degree Day Start
- Raw Barometric Pressure
- Adjusted Barometric Pressure
- Density Altitude
- Wet Bulb Globe Temperature
- Wet Bulb Temperature
- Saturated Vapor Pressure
- Vapor Pressure
- Dry Air Pressure
- Dry Air Density
- Wet Air Density
- Absolute Humidity
- Air Density Ratio
- Adjusted Altitude
- SAE Correction Factor
- Rain Today
- Rain this week
- Rain this month
- Rain this year
- Rain Rate
- Hail Today
- Hail Rate
- True North Offset
- Start of Day
- Start of Week
- Start of Month
- Start of Year

The Select Measurements page allows the user to customize the measurements (parameters) displayed and included in output files.



## Units

### Selected Units

Rain:

Temperature:

Wind Speed:

Pressure:

Altitude:

The Units page allows the user to select the desired units for the weather parameters in the Realtime Display and the Latest Measurements pages.

Please note that the data log files and the XML/CSV outputs always use American Standard units.

## Parameter Settings

### Parameter Settings

Altitude:

Barometric pressure offset:

Temperature 1 offset:

Degree day start month:

Degree day start day (1-31):

Degree day reference temp.:

The Parameter Settings page allows the user to enter station specific data.

**Altitude:** The elevation of the station, specifically the sensor transmitter. This setting will change the adjusted Barometric Pressure reading. Altitude is in feet.

**Barometric pressure offset:** This offset allows the user to calibrate the barometric pressure sensor to match a local standard. Barometric Pressure Offset is set in Inches Hg.

**Temperature 1 offset:** This offset allows the user to adjust the temperature reading. The offset is in °F.

**Degree Day:** For degree day calculations, enter the start month, start day and reference temperature.

## Firmware Update

### Update Firmware

Select new firmware image file:  No file chosen

Updating may be done with an update image on a USB flash drive

Firmware updates may be made available on Columbia Weather Systems' web site ([www.columbiaweather.com](http://www.columbiaweather.com)), or can be emailed directly to the user.

The update firmware file has a ".msu" extension and does not need to be unzipped or altered in any way.

Copy the file to a computer on the network. Click on Choose File and select the file. Click on Update Firmware to install the new file.

The MicroServer can also be updated using a USB memory drive. Please contact Columbia Weather Systems for USB firmware image.

**It is very important that the power is not disconnected from the Weather MicroServer during this process. Do not attempt firmware update during periods of power uncertainty.**

# Diagnostics

## Diagnostics

Firmware Version: 1.00.1195 [2008-07-14 21:56:09]  
Kernel Version: 2.6.21-ts  
Serial Number:  
Current Time: 2008-07-21 10:13:16  
Hardware Time: Mon Jul 21 10:13:16 2008 0.000000 seconds  
IP address: 192.168.0.51  
Subnet mask: 255.255.255.0  
Gateway: 192.168.0.1  
DNS Server: 192.168.0.1  
Data Manager Status: Running  
Device Status: up 6 days, 15:08, load average: 1.22, 1.26, 1.21  
Device running from: Flash  
SD card status: ok  
User:  
System:  
Idle:

[Copyright information](#)

The Diagnostics page displays troubleshooting information.

## Start Data Manager

The Data Manager software starts automatically on power up. In the event the software has been stopped, click on Start Data Manager button to start the software

## Stop Data Manager

Click on Stop Data Manager to stop the software. The user will still have access to the User Interface after the software is stopped.

## Restart Data Manager

Click on Restart Data Manager to stop the software and then start it again. This feature is similar to a computer reboot.

## Reboot

Reboot button restarts the Linux operating system.

## XML Web Server

The Weather MicroServer includes an XML Web Server available for other programs to access weather data.

The XML page address is:

<http://192.168.0.50/latestsampledata.xml>

With all the measurements selected, the XML file will be structured as follows:

```
<oriondata station="CWS MicroServer">
  <meas name="mtSampTime">2010/10/28 09:26:25</meas>
  <meas name="mtWindSpeed">1.3</meas>
  <meas name="mtRawWindDir">215</meas>
  <meas name="mtAdjWindDir">215</meas>
  <meas name="mt3SecRollAvgWindSpeed">1.3</meas>
  <meas name="mt3SecRollAvgWindDir">217</meas>
  <meas name="mt2MinRollAvgWindSpeed">1.6</meas>
  <meas name="mt2MinRollAvgWindDir">233</meas>
  <meas name="mt10MinRollAvgWindSpeed">1.6</meas>
  <meas name="mt10MinRollAvgWindDir">233</meas>
  <meas name="mt10MinWindGustDir">203</meas>
  <meas name="mt10MinWindGustSpeed">1.9</meas>
  <meas name="mt10MinWindGustTime">2010/10/28 09:26:04</meas>
  <meas name="mt60MinWindGustDir">203</meas>
  <meas name="mt60MinWindGustSpeed">1.9</meas>
  <meas name="mt60MinWindGustTime">2010/10/28 09:26:04</meas>
  <meas name="mtTemp1">49.1</meas>
  <meas name="mtRelHumidity">91</meas>
  <meas name="mtWindChill">49.1</meas>
  <meas name="mtHeatIndex">49.0</meas>
  <meas name="mtDewPoint">46.6</meas>
  <meas name="mtDegreeDay">17.7</meas>
  <meas name="mtAvgTempToday">49.7</meas>
  <meas name="mtDegreeDayStart">2010/04/24 00:00:00</meas>
  <meas name="mtRawBaromPress">29.74</meas>
```

<meas name="mtAdjBaromPress">29.94</meas>  
<meas name="mtDensityAltitude">-294</meas>  
<meas name="mtWetBulbGlobeTemp">56.4</meas>  
<meas name="mtWetBulbTemp">46.9</meas>  
<meas name="mtSaturatedVaporPressure">0.35</meas>  
<meas name="mtVaporPressure">0.32</meas>  
<meas name="mtDryAirPressure">29.42</meas>  
<meas name="mtDryAirDensity">0.0767</meas>  
<meas name="mtWetAirDensity">0.0772</meas>  
<meas name="mtAbsoluteHumidity">0.0005</meas>  
<meas name="mtAirDensityRatio">1</meas>  
<meas name="mtAdjustedAltitude">-130</meas>  
<meas name="mtSAECorrectionFactor">1</meas>  
<meas name="mtRainToday">0.13</meas>  
<meas name="mtRainThisWeek">0.96</meas>  
<meas name="mtRainThisMonth">3.41</meas>  
<meas name="mtRainThisYear">6.60</meas>  
<meas name="mtRainRate">0.00</meas>  
<meas name="mtHailToday">0</meas>  
<meas name="mtHailRate">0</meas>  
<meas name="mtExtinctionCoefficient">1</meas>  
<meas name="mtVisibility">1.79</meas>  
<meas name="mtLux">0</meas>  
<meas name="mt3SecRollAvgWindSpeed\_2">0.0</meas>  
<meas name="mt3SecRollAvgWindDir\_2">0</meas>  
<meas name="mt2MinRollAvgWindSpeed\_2">0.0</meas>  
<meas name="mt2MinRollAvgWindDir\_2">0</meas>  
<meas name="mt10MinRollAvgWindSpeed\_2">0.0</meas>  
<meas name="mt10MinRollAvgWindDir\_2">0</meas>  
<meas name="mt10MinWindGustDir\_2">0</meas>  
<meas name="mt10MinWindGustSpeed\_2">0.0</meas>  
<meas name="mt10MinWindGustTime\_2">2010/10/28 09:25:06</meas>  
<meas name="mt60MinWindGustDir\_2">0</meas>

---

```
<meas name="mt60MinWindGustSpeed_2">0.0</meas>
<meas name="mt60MinWindGustTime_2">2010/10/28 09:25:06</meas>
</oriondata>
```

The field order in the XML file is based on the same order as the selected measurements in the Select Measurements page.



# SECTION 4: 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 Weather MicroServer for repair or replacement. Follow the packing instructions carefully to protect your instrument in transit.

## Limited Warranty

Columbia Weather Systems, Inc. (CWS), warrants the Weather MicroServer to be free from defects in materials and/or workmanship when operated in accordance with the manufacturer's operating instructions, for one (1) 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 unit, first call the 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 Weather MicroServer as follows:
  - A. Packing
    - ◆ Wrap the MicroServer 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, 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

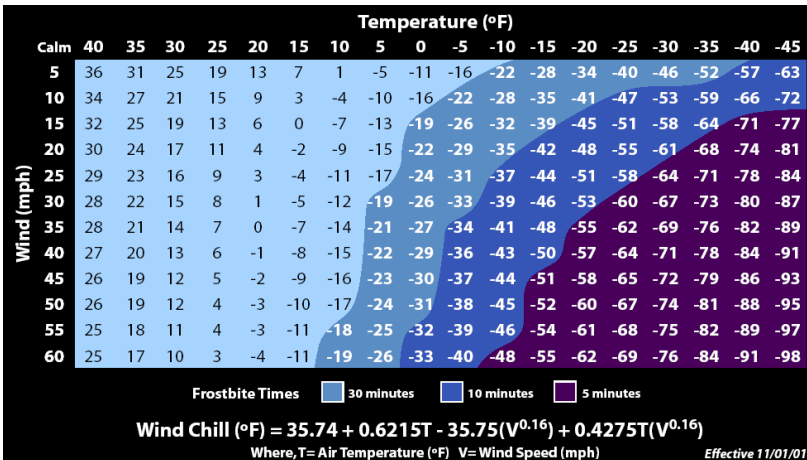
# Tables and Formulas

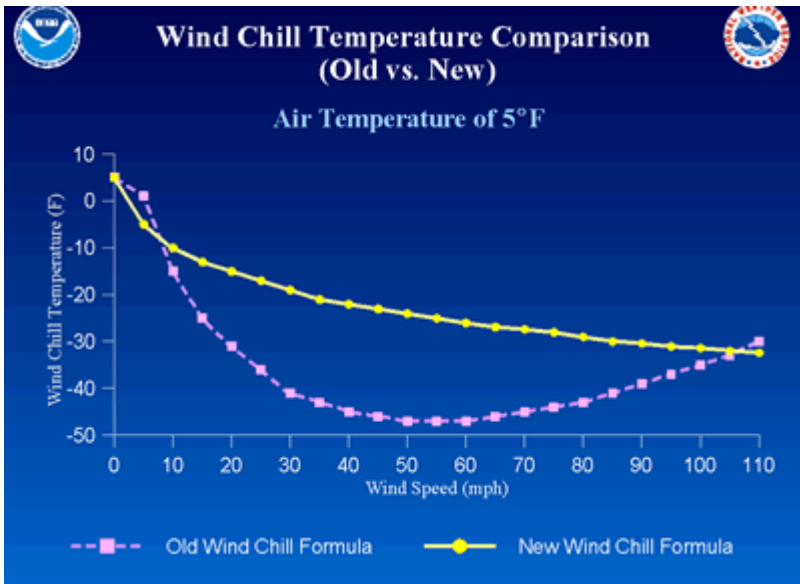
## Wind Chill Chart

In 2001, NWS implemented an updated Wind chill Temperature (WCT) index. The change improves upon the former WCT Index used by the NWS and the Meteorological Services of Canada, which was based on the 1945 Siple and Passel Index.

In the fall of 2000, the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) formed a group consisting of several Federal agencies, MSC, the academic community (Indiana University-Purdue University in Indianapolis (IUPUI), University of Delaware and University of Missouri), and the International Society of Biometeorology to evaluate and improve the windchill formula. The group, chaired by the NWS, is called the Joint Action Group for temperature Indices (JAG/TI). JAG/TI's goal is to upgrade and standardize the index for temperature extremes internationally (e.g. Wind chill Index).

The current formula uses advances in science, technology, and computer modeling to provide a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.





## Wind Chill Equation

$$WC = 35.74 + 0.6215 T - 35.75(V^{0.16}) + 0.4275 T(V^{0.16})$$

Where:

WC = wind chill temperature in °F

V = wind velocity in mph

T = air temperature in °F

**Note:** Wind chill Temperature is only defined for temperatures at or below 50 degrees F and wind speeds above 3 mph.



## Heat Index

| RH  | Temperature in °F |    |    |     |     |     |     |     |     |     |     |     |     |     |
|-----|-------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | 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

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

$$\text{Dew Point in } ^\circ\text{C} = (238.3 * B) / (1-B)$$

Where:

RH = Relative Humidity

T = Temperature in  $^\circ\text{C}$

Ln = Natural logarithm



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