



## **WeatherHawk Series 500**



### **General Description:**

The WeatherHawk Series 500 family of weather stations measure and record wind speed and direction, air temperature and relative humidity, barometric pressure, solar radiation, and rain. In addition, the system calculates and exports an evapotranspiration (ET) value that can be used by third party systems for irrigation control. They are designed for applications where a minimal visual impact, high reliability, and a long interval between routine servicing are significant factors in the decision to purchase.

The Series 500 family is fully compatible with all versions of software, data management, input power and mounting accessories designed for the WeatherHawk Signature Series. It is also backwards compatible with all third party certified software drivers.

The principle difference between the Series 500 and Signature Series WeatherHawk systems is that the Series 500 utilizes solid state sensors, with no moving parts. Solid state sensors enable a low profile design better suited to high visibility locations where a traditional weather station would be visually objectionable; they have higher reliability and a longer interval between routine service and inspection requirements; they are more robust and less susceptible to damage from wind carried debris; and they are not impaired by heavy snowfall or freezing conditions that produce rime ice (NOTE: Heated sensor versions, Models 511/521, must be used in snow or freeze zone applications).

### **Models 510/511**

These versions of the Series 500 weather station are directly connected to a host device (PC or server) through an RS232 serial data I/O located on the bottom of the weather station. The Model 511 incorporates a thermostatically controlled heater element in the sensor head that keeps the ultrasonic wind sensor elements and the piezometric precipitation sensor surface free of snow and ice to  $-52^{\circ}$  C.

### **Models 520/521**

These versions of the Series 500 weather station are wireless to a host device (PC or server) using fully integrated industrial grade 916 MHz spread spectrum RF communications technology. They also have an RS232 serial data I/O located on the bottom of the weather station, which can be used as a second serial communications port, or for programming and testing the system, or for direct data downloads using a PC or PDA. The Model 521 also incorporates a thermostatically controlled heater element in the sensor head that keeps the ultrasonic wind sensor elements and the piezometric precipitation sensor surface free of snow and ice to  $-52^{\circ}$  C. Optional configurations of both units enable replacement of the 916 MHz RF components with 922 MHz and 2.4 GHz RF components to comply with local, regional or national radio frequency licensing requirements.

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## ***Sensor Technologies***

Series 500 WeatherHawk weather stations employ the latest in weather measurement sensors. Wind speed and direction use acoustic techniques formerly available on only the most expensive professional wind velocity measurement systems. Rain is measured using an impact surface that literally counts the raindrops and measures their acoustic signature, integrating that information to provide a near real-time value for rainfall amount and rate. Barometric pressure, relative humidity, air temperature and solar radiation measurements are made by calibrated scientific grade sensors typically installed in the finest professional weather measurement and monitoring systems.

*Wind Speed & Direction* is measured by a sensor consisting of three equally spaced ultrasonic transducers in a horizontal plane. The sensor measures the bi-directional transit time along the three paths established by the transducer array. This transit time is dependent on the wind velocity across the ultrasonic path. For zero wind velocity, both the forward and reverse transit times are identical; with wind, the upwind transit time increases and the downwind time decreases. The values of any two array paths will enable computation of both wind speed and direction, and a signal processing technique enables the measurement to be calculated using the two array paths of the best quality. If the system is used in a high accuracy application a factory recalibration is recommended every five years.

*Rainfall* is measured with a stainless steel piezometric surface on top of the weather station. As individual raindrops (or hailstones) impact on the surface they each provide an acoustic signature that is measured and processed in real-time to give a value for their volume. The volume is then processed with respect to time to provide a rainfall rate. This measurement technique eliminates all of the traditional problems with tipping bucket type rainfall measurement devices, including worn or damaged bearings, clogged funnels and drip orifices, and damage from wind blown debris.

*Air temperature and relative humidity (RH)* sensors are combined in an integrated, user replaceable unit that requires no calibration. The RH sensor is a thin polymer, capacitive type sensor that degrades with exposure due to age and airborne contaminants. It should be user replaced every three years to maintain accuracy, and at a shorter interval if the location is subject to high levels of air pollution or is subject to airborne chemical spraying. The air temperature sensor is a capacitive ceramic sensor that is typically not subject to environmental degradation.

*Barometric pressure* is measured with a capacitive silicon temperature corrected strain gauge device that is typically not degraded by environmental exposure and does not require calibration after manufacture.

*Solar Radiation* is measured by a silicon pyranometer with a cut filter limiting the spectral exposure to the 300-1100 nm wavelength. This device typically degrades at a rate of 2% of the full scale value each year and should be recalibrated, or replaced every 3-5 years, depending on the application.

## ***Data Transfer Protocols, Software and Data Interface Hardware***

All WeatherHawk systems communicate using a proprietary Pakbus protocol. Any qualified software developer may request a software development kit, at no charge, to assist in the development of software drivers for third party devices or software.

## Software

WeatherHawk offers the following software applications for weather station management, data acquisition and logging, report generation and data display.

- *Visual Weather Station* – a single host, multi-site professional application that will communicate with any WeatherHawk weather station, as well as CR200 Series data loggers from Campbell Scientific, Inc. Visual Weather Station adapts to any data telemetry scheme including direct connection, wireless short haul RF (spread spectrum radio), wireless long-haul RF (VHF/UHF radio), satellite modem, IP modem/server module, or landline and cellular modems. The application also offers a variety of standard and user defined reports and export file formats, and it will support the generation, export and update of a weather data GUI for a website. This application runs on PC-XP computers.
- *WeatherHawk-XP/X* – a single host, single site consumer application that will communicate with any WeatherHawk weather station. WeatherHawk-XP/X connects using a directly to the serial port on the WeatherHawk, or by wireless short haul RF (spread spectrum radio), or IP modem/server module, or landline and cellular modems. The application also offers a three export file formats, and it will support the generation, export and update of a weather data GUI for a website. This application runs on PC-XP and Macintosh OS-X computers.
- *Virtual Weather Station* – a single host, single site consumer application that will communicate with any WeatherHawk weather station. Virtual Weather Station connects directly through the serial port on the WeatherHawk, or by wireless short haul RF (spread spectrum radio). The application also offers a two export file formats, and it will support the generation, export and update of a weather data GUI for a website. This application runs on IBM compatible computers.
- *LoggerNet* – a single host, multi-site professional application that will communicate with any WeatherHawk weather station, as well as any data loggers from Campbell Scientific, Inc. LoggerNet adapts to any data telemetry scheme including direct connection, wireless short haul RF (spread spectrum radio), wireless long-haul RF (VHF/UHF radio), satellite modem, IP modem/server module, or landline and cellular modems. The application also offers a variety of standard and user defined reports and export file formats, and with the RTMC module it will support the generation, export and update of a weather data GUI for a website. This application runs on IBM compatible computers.
- *PConnect* – a single host, single site professional application that will communicate with any WeatherHawk weather station, as well as a range of Campbell Scientific data loggers. PConnect is used for direct download and storage of data through the serial port on either the weather station or its companion RF4xx receiver (if wireless). The software is typically utilized for field data acquisition with later export to a PC for post-processing, display and long-term archiving. It also enables on-site reprogramming of the weather station by uploading pre-configured program files. It is not designed for long haul or automated data collection protocols. This application runs on a range of PDA devices, check with Campbell Scientific, or WeatherHawk for a list of compatible units.

- Weather Display – a single host, single site consumer application that will communicate with any WeatherHawk weather station. Weather Display connects directly through to the serial port on the WeatherHawk, or by wireless short haul RF (spread spectrum), or IP modem/server module. The application also offers a range of export file formats, and it will support the generation, export and update of a weather data GUI for a website. This application runs on PC-XP computers.

### **Data Interface Hardware**

Weatherproof serial cables are available in 25, 50 and 75 foot lengths for permanent direct connection to the RS232 I/O on any WeatherHawk weather station. These cables feature nickel plated brass DB-9 connectors for corrosion resistance and have a Sanoprene jacket which is suitable for both high UV and direct burial environments.

An RF4xx spread spectrum RF transceiver is supplied as standard equipment with every wireless WeatherHawk weather station. The unit comes with an AC power supply (120 VAC/60 Hz), a 6 foot serial cable and an antenna. Additional RF4xx kits can be purchased for simultaneous communication with any WeatherHawk wireless weather station, enabling multiple host computers to use the data from a single weather station. Typical applications for multiple receiver units are in home automation where a single weather station may support a whole house control unit, with touch panel data display units; and a discrete PC, which may act as the server for a local intranet or internet weather data display website.

WeatherHawk IP server modules are a proprietary web server that is designed to interface the serial output of any WeatherHawk weather station, or companion RF4xx transceiver with an Ethernet. Output formats from the IP server module are HTML, XML and CSV (with headers).

### **Mounting Systems**

All WeatherHawk weather stations will interface with the full range of mounting systems supplied by WeatherHawk. They consist of:

TP-1 Tripod – The tripod, with its range of accessories is the most rugged and adaptive weather station mounting system. It supports both rooftop (sloped and flat) and ground mounts, with mast heights to 10 feet. Accessories consist of a weather station alignment kit (optional), ground stakes (optional), a rooftop sealing kit (standard), grounding rod kit (optional), mast length extensions (optional), and a guy-wire kit (optional).

HM Series – The HM Series house mount kits are adapted satellite dish mounts that will support attachment to sloped and flat roofs, and to the vertical fascia and reinforced trim boards around the roofline of a home. The accessories consist of mast extensions, a Retro-deck base assembly that offers additional stability and support on composite roof coverings; and a Comm-deck mount that offers a weatherproof penetration through a roof for a directly connected weather station.

Various additional specialized mounting tripods are available for high environmental abuse environments, or quick deployment temporary applications.

