



## **WEATHERPAK® EOC**

### **Operations & Maintenance Manual**

November 26, 2012

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## IMPORTANT NOTES

Please call Coastal Environmental Systems if any issues arise or if you have questions regarding the WEATHERPAK® EOC.

**Coastal Environmental Systems, Inc.**  
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**Seattle, WA 98134**

**Main: 800-488-8291 • Fax: 206-682-5658**

**Parts & Service: x157**

**Support@CoastalEnvironmental.com**

- **WHEN CONTACTING US, PLEASE REFER TO THE MODEL NUMBER AND SERIAL NUMBER** of your WEATHERPAK® EOC. The serial number is located on a silver label located near the bottom of the WEATHERPAK® EOC cylinder.
- **WASH OR DECON THE WEATHERPAK® EOC WHEN FULLY ASSEMBLED.** Do not allow water to enter the connectors. WEATHERPAK® EOC is water-resistant only when completely assembled.
- **FOLLOW THE MAINTENANCE SCHEDULE.**
- **DO NOT OPEN OR DISASSEMBLE THE WEATHERPAK® EOC.** The WEATHERPAK® EOC is double O-ring sealed and purged with desiccant to assure a watertight seal. Opening the cylinder will allow moisture in, damage the electronics, and invalidate your warranty.
- **DO NOT REMOVE THE ANTENNA FROM THE WEATHERPAK® EOC.** If the WEATHERPAK® EOC is activated without the antenna, the radio will be damaged.
- WEATHERPAK® EOC sensor array may contain some or all of the sensors mentioned in this document.
- WEATHERPAK® EOC may employ a radio or Ethernet or both means of communication.

# 1. SYSTEM OVERVIEW

## 1.1 Introduction

The WEATHERPAK® EOC measures wind speed, wind direction, air temperature and GPS. Options for the WEATHERPAK® EOC include relative humidity, barometric pressure, gamma radiation sensor, radio transmitter, base station, and 3 types of software; INTERCEPT® (single work station), INTERCEPT® (Network version up to 10 users), and INTERCEPT® (network version up to 50 users).

WEATHERPAK® EOC was specifically designed for use for emergency management purposes. The following is a list of some of the features that make the WEATHERPAK™ EOC unique:

- WEATHERPAK® EOC features an advanced electronic interface, which allows the use of features such as GPS, the EOC's unique automatic networking capability, as well as future enhancements as they are needed.
- The wind sensor is an advanced technology, "ultrasonic" style anemometer. The ultrasonic wind sensor has no moving parts, is very accurate (particularly at very low wind speeds), and does not require periodic calibration.

In addition to the above features, EOC shares the following with the rest of the WEATHERPAK® line of products:

- May automatically update CAMEO®/ALOHA®, CHARM®, MIDAS® and other plume modeling software programs.
- Built-in electronic compass allows the WEATHERPAK® EOC to be set up in any orientation – will automatically determine True North and give you true wind direction.
- The electrical connections are designed to be intrinsically safe and the housing and tower are constructed of 6061-T6 aluminum, a non-corrosive and non-sparking alloy.
- Designed to withstand decontamination procedures. The WEATHERPAK® EOC housing is double O-ring sealed and dried with a desiccant to protect the electronics against moisture.
- All electronics are grounded at a single point to protect the WEATHERPAK® EOC against EMI (electro-magnetic interference) and RFI (radio frequency interference), thus assuring reliable data and transmission.
- Designed to meet MIL-STD-461E (EMI) and MIL-STD-810F (extreme environments).

This manual will familiarize you with the installation, operation, and maintenance of the WEATHERPAK® EOC. Please read all of the instructions before attempting to operate or troubleshoot the system.

## 1.2 Siting Considerations

### 1.2.1 Compass Accuracy

The WEATHERPAK® EOC contains an electronic compass for automatic alignment to True North. If placed laterally near a large mass of steel or other magnetic material, an erroneous compass reading may result. (The top of a van is OK, but next to it is not an ideal location). Try to place the WEATHERPAK® EOC at least 30 meters laterally from large vans, busses, cranes, metal buildings, etc.

### 1.2.2 Proper Wind Measurement

Select a site that is as unobstructed as possible. Structures, trees, terrain, etc. will disrupt the wind flow for a considerable distance. The WEATHERPAK® EOC should be placed approximately 30 ft (10 meters) above the ground and ten times the height of an obstruction away from that obstruction (e.g. should be 400 ft from a 40 ft tall building). This is a guideline, not a rule.

## 1.3 Data Message

The raw data message being transmitted by the WEATHERPAK® EOC will look similar to the following:

1329,2.19,140,67.7,23.2,2.9,187,73.7,11.9,2018,1008,27,2661,4,1439,4735.705,  
-12220.026,,,,2893

### DATA LINE INTERPRETATION

**ID, MW, MD, ST, AT, SI, DI, TI, BV, CKSUM1, BP, RH, CKSUM2, SAT, GMT,  
LAT, LON,,,,CKSUM3**

<b>ID</b> –	WEATHERPAK® EOC unique identification number
<b>MW</b> –	5 minute averaged wind speed in meters per second
<b>MD</b> –	5 minute averaged wind direction in degrees
<b>ST</b> –	Stability class in degrees
<b>AT</b> –	5 minute averaged air temperature in degrees Celsius
<b>SI</b> –	Instantaneous wind speed in meters per second
<b>DI</b> –	Instantaneous wind direction in degrees
<b>TI</b> –	Instantaneous air temperature in degrees Celsius
<b>V</b> –	Voltage in volts
<b>CKSUM1</b> –	First checksum

<b>BP</b> –	Barometric pressure in millibars
<b>RH</b> –	Relative humidity in percent (if available)
<b>CKSUM2</b> –	Second checksum
<b>SAT</b> –	Number of satellites acquired
<b>GMT</b> –	Greenwich Mean Time
<b>LAT</b> –	GPS Latitude
<b>LON</b> –	GPS Longitude
<b>CKSUM3</b> –	Third checksum



## 2. METHOD OF OPERATION

### 2.1 Introduction

This section provides detailed information about the system components and their interactions.

### 2.2 System Power

#### 2.2.1 Power Over Ethernet (POE)

Power is supplied to the WEATHERPAK® EOC via a Power Over Ethernet (POE) Injector. The POE Injector is an indoor piece of equipment requiring an AC outlet providing 100-240V AC 50/60 Hz (see Figure 2.1). The POE Injector converts AC power to POE DC power and sends the DC voltage to the POE Splitter (see Figure 2.2) over a standard Ethernet cable. The POE splitter is housed in the junction box below the WEATHERPAK® EOC.



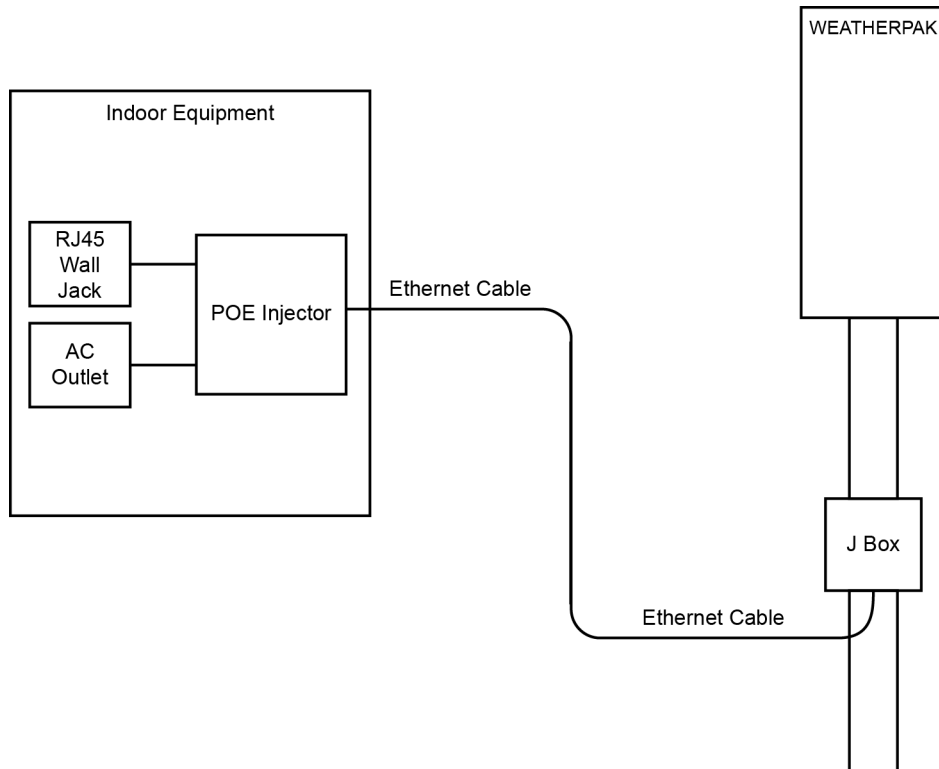
***Figure 2.1 – Power Over Ethernet Injector***



***Figure 2.2 – Power Over Ethernet Splitter in J Box***

### **2.3 System Signal and Data Flow**

Data flow from the WEATHERPAK® EOC is via the same Ethernet cable that provides power to the WEATHERPAK® EOC. A single Ethernet cable provides power and returns data to the network.



***Figure 2.3 – System Data and Power Flow Diagram***

## 2.4 Sensors

The system uses COTS (commercial off the shelf) sensors. A brief description of each sensor, including sensor specifications, is provided in the following sections.

### 2.4.1 Wind Sensor

The wind sensor measures both horizontal wind speed and wind direction. The wind sensor is mounted at the top of the WEATHERPAK® EOC so that disturbance from ground objects is minimized. The wind sensor has an array of four equally spaced transducers in a horizontal plane used to determine horizontal wind speed and direction. The measurement principle is based on transit time, the time it takes for the ultrasound to travel from one transducer to another. Transit time is affected by wind speed along the ultrasonic path. The transit time is measured in both directions. For zero wind speeds, both the forward and reverse transit times are equal.

***Table 2-1 – Wind Sensor Specification Data***

Operating Temperature Range	-55 °C to +70 °C
Measuring Range	0 to 100 %RH
Wind Speed Range	0-75 m/s (168 mph)
Wind Speed Accuracy	±2% @12 m/s (27 mph)
Wind Speed Resolution	0.01 m/s
Wind Direction Range	0-359°
Wind Direction Accuracy	2°
Wind Direction Resolution	1°

### 2.4.2 Ambient Temperature / Optional Relative Humidity (AT/RH) Sensor

The AT/RH sensor is housed inside the sealed WEATHERPAK® EOC. The output voltage of the probe ranges from 0 to 1 VDC. Output voltages from the sensor are sent to the ZENO® in the WEATHERPAK® EOC for processing via an integral cable.

The radiation shield protects the sensor from incoming short wave solar radiation as well as outgoing long wave radiation and provides excellent sensor contact with the incoming ambient air.

***Table 2-2 – AT/RH Sensor Specification Data***

Operating Temperature Range	-30 °C to +60 °C
Measuring Range	0 to 100 %RH
Output Scale	0 ... 100 %RH equals 0 ... 1 VDC
RH Accuracy	± 3%
Temp Accuracy	± 0.6°C

### 2.4.3 Barometer (Optional)

The Barometer is housed in the WEATHERPAK® EOC. The data is sent to the ZENO® where it is processed. The system uses atmospheric pressure and site-specific constants to compute altimeter setting. The sensor is a versatile electronic barometer featuring high accuracy, low power, wide operating temperature range with RS-232 serial data I/O. An accuracy of ±0.3 hPa rms is maintained over the entire specified operating pressure and temperature range.

***Table 2-3 – Barometer Specification Data***

Operating Temperature Range	-40°C to +85°C
Operating Pressure Ranges	500 to 1200 hPa (mb)
Accuracy	± 1mb at 22°C / ± 3mb full range

## 2.5 WEATHERPAK® EOC

The WEATHERPAK® EOC consists of a ZENO® Datalogger, optional barometer, temperature sensor, optional relative humidity sensor, compass, communications link, and power supply circuitry in a sealed weatherproof enclosure. The WEATHERPAK® EOC sends control and polling signals to the sensors and receives data signals from the sensors.

The compass automatically aligns to magnetic north. If placed laterally near a large mass of steel or other magnetic material, an erroneous compass reading may result. (The top of a van is OK, but next to it is not an ideal location). Try to place the WEATHERPAK® EOC at least 30 meters laterally from large vans, busses, cranes, etc.

### 2.5.1 ZENO®

The ZENO® accepts and stores sensor data from the AT/RH sensor, barometer and wind sensor. It also checks alarms and control functions (diagnostic inputs) including ZENO® Datalogger power monitor. Analog data are converted to serial digital data with low (12 bit, 10,000 samples/s, 2 channels maximum), high (15 bit, 10 samples/s), or ultra-high (18 bit, 2 samples/s) resolution. The ZENO® Datalogger processes the sensor data in a 32-bit microcontroller and then sends the processed sensor and other data in RS-232 serial format. The microcontroller allows extremely

fast and powerful computing of multiple routines and uses advanced power management for very low power consumption. A true real-time executive is used to achieve multi-tasking which samples and communicates simultaneously. The ZENO® Datalogger operates using embedded firmware. The SRAM stores all sensor and program settings. Functions include analog signal conversion, digital input/output, serial communication, programming, and data memory. A real-time clock is also provided.

## **2.6 Software**

The system software consists of firmware running in the WEATHERPAK® EOC and application software typically loaded on a PC or server. The software includes a data recorder, database, algorithms, graphical user interface and a communication module for sending messages.

Software running on the computer is divided into two major categories: communications and processing and storage. The communications software can be run on the same CPU as the other applications or can be partitioned off on another CPU if the communications requirements warrant it.

### 3. MAINTENANCE

#### 3.1 Recommended Preventive Maintenance Schedule

**NOTE**

In certain locations, local conditions may warrant more frequent cleaning and corrosion control.

***Table 3-1 – Scheduled Maintenance Intervals Summary (Days)***

Equipment	General Cleaning	Corrosion Control
WEATHERPAK® EOC	84	84
Wind Sensor	84	84

#### 3.2 Consumable Items Needed for Maintenance

***Table 3-2 – Consumable Items***

Item	Type/Model/Part Number
1. Cloth, cotton, lint-free	Any
2. Detergent, mild	Any
3. Water	Any

### **3.3 Scheduled Maintenance**

#### **3.3.1 Wind Sensor**

Material Required

Cloth, Cotton, Lint-free

Mild detergent w/ water

- a. Inspect and clean wind Sensor as necessary, using a soft, lint free cotton cloth moistened with water and a mild detergent.

#### **3.3.2 WEATHERPAK® EOC**

Material Required

Cloth, Cotton, Lint-free

- a. Clean WEATHERPAK® EOC using a soft, lint free cloth.

## **4. COMPONENT REMOVAL AND INSTALLATION PROCEDURES**

### **4.1 Introduction**

This section describes the removal and replacement (installation) procedures for primary components.

### **4.2 Wind Sensor**

#### **4.2.1 Removal**

- a. Note the location of the cable ties; two small ones on the wind sensor reflector plate stanchion and two larger ones on the neck of the sensor. When a replacement sensor is installed, cable ties will need to be installed in these locations.
- b. Cut the cable ties.
- c. Remove the three screws with washers at the base of the sensor then gently pull the sensor straight up. Be careful not to pull too hard as you may damage the wire harness for the sensor.
- d. Grasp the connector body and turn counterclockwise to remove it. You may need to use pliers as the connector fits tightly to the sensor.

#### **4.2.2 Installation**

- a. Remove the new sensor from the box and remove the rubber safety cap from the bottom connector of the sensor.
- b. Attach the WEATHERPAK® EOC connector to the bottom of the sensor and turn clockwise to lock in place.
- c. Carefully mount the sensor on the top plate assembly making sure the wire harness does not get pinched. All of the wire harness should fit inside the neck of the top plate.
- d. Make sure the red arrow on the bottom of the sensor body points in the opposite direction (North) of the notch (South) on the bottom connector of the WEATHERPAK® EOC.



- e. Install the three screws with washers removed earlier and carefully hand tighten them.
- f. Install cable ties: Two small ones on the wind sensor reflector plate stanchion and two larger ones on the neck of the sensor.

## **4.3 WEATHERPAK™ EOC**

### **4.3.1 Removal**

- a. Remove power going to the system by unplugging the Power Over Ethernet (POE) Injector from the wall outlet.
- b. Lift up the arms of the clamp, then lift up on the WEATHERPAK® EOC and remove.

### **4.3.2 Installation**

- a. Align the slot on the WEATHERPAK® EOC with the guide pin on the quick release and push straight in.
- b. Press the arms of the clamp down to assure a tight fit.
- c. Connect power cable from Power Over Ethernet (POE) Injector to wall outlet.