

NPS Portable Ozone Monitoring System (POMS) Mark II Design

The POMS II is a revision to the original design that is lighter, cheaper, and without the filter pack measurement capability. The purpose is to be a self-contained unit that can measure ozone and meteorological parameters in park locations without available power and phone.

Concept diagram

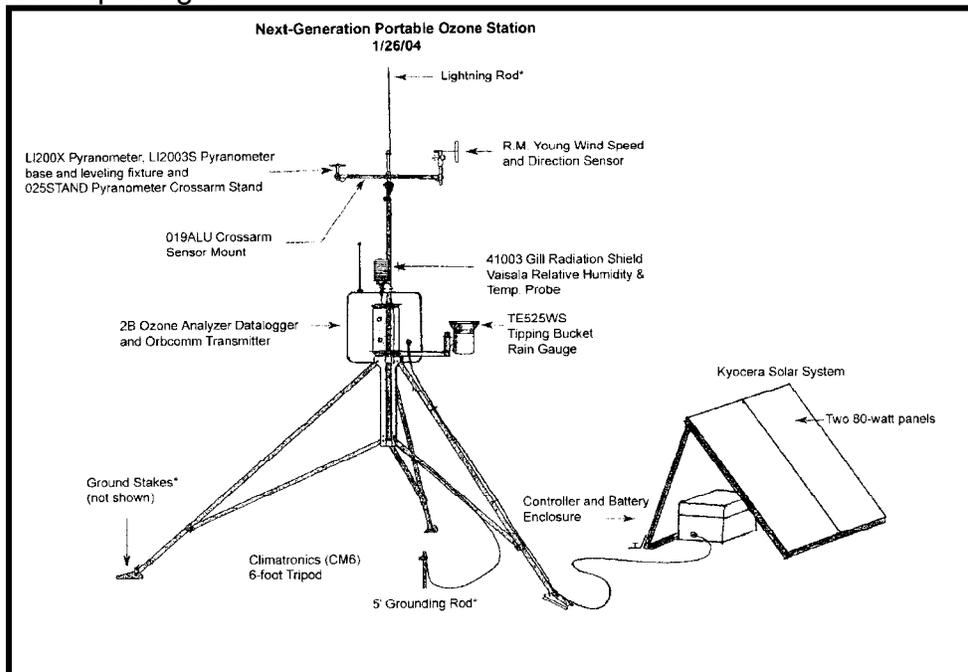


Figure 1.

Design Considerations and Assumptions

The primary design considerations are:

- UPS shippable in several boxes
- Can be installed by one field technician
- Tripod mounting system with 6' mast for instrumentation
- Solar powered; separate skid-mounted system (2 panels with controller and batteries)
- Contains one (1) 2B Tech ozone analyzer
- Campbell 23X datalogger and Orbcomm transmitter
- Meteorological sensors
 - Wind speed and direction at 6' mast height
 - Temperature and relative humidity (naturally aspirated) at 4'
 - Solar radiation at 6'
 - Precipitation (tower mounted at 3')

- Weather-proof ventilated enclosures for 2B, datalogger, and power system
- All systems will run at ambient temperature

The systems are self contained and able to run reliably with minimum operator support for the ozone season (May to September). Daily zeros are automatically performed on the 2B Tech analyzer to assess its operational status. The site operator is required to change the ozone inlet filter approximately every two weeks. If a 2B Tech analyzer failure occurs, the site operator will be able to easily replace the 2B with a backup operational unit shipped to the park.



Figure 2. Photo of a POMS II. The main unit is a tripod with the meteorological sensors and two instrument boxes. The solar panel and battery box are in a separate frame.



Figure 3. The 2B Technologies ozone analyzer has its own instrument case. The analyzer folds up into the box to close the cover. A sun shade is above the box and an internal fan inside is thermostatically controlled.



Figure 4. The Campbell Datalogger, Orbcomm satellite modem, relays, and electrical systems are in the second instrument box.

Table 1. Components used in the NPS POMS II design.

COMPONENT	PART	MANUFACTURER	MODEL #	# OF UNITS
TRIPOD WITH 6' MAST	Tripod w/ Lightning Rod Kit & Stakes	Campbell Scinetific	CM6	1
	Crossarm Sensor Mount		019ALU	1
SUBTOTAL PLATFORM				

COMPONENT	PART	MANUFACTURER	MODEL #	# OF UNITS
DATA ACQUISITION	Data Logger	Campbell	CR23X	1
	Rechargeable Battery and Case	Campbell	10518	1
	Wall Charger AC	Campbell	9591	1
	Storage Module - 4mb	Campbell	SM4M	2
	Storage Module Mounting Bracket	Campbell	13690	1
	Software	Campbell	PC-208	0
	Relay Driver - 4 Channel	Campbell		1
	Surge Protection Rail	Campbell	SVP48	0
	Surge Protection Module	Campbell	8206	0
SUBTOTAL DATA ACQUISITION				

COMPONENT	PART	MANUFACTURER	MODEL #	# OF UNITS
METEOROLOGY SENSORS	Wind Monitor	RM Young	05103-25	1
	Rain Gauge - 8" Tipping Bucket		TE525WS-25	1
	Temp/RH Prober	Vaisala	HMP45C-25	1
	12 Plate Shield for HMP45C		41002	1
	Solar Radiation Sensor	Licor	LI200X-25	1
	Base/Leveling Fixture		LI20035	1
	Pyranometer Mount (for Raingauge)		015ARM	2
	Barometer	Vaisala	PTB-101B	0
SUBTOTAL METEOROLOGY SENSORS				

COMPONENT	PART	MANUFACTURER	MODEL #	# OF UNITS
COMMUNICATIONS	Telephone Modem	Campbell		0
	Orbcomm Modem & Antennae			1
SUBTOTAL COMMUNICATIONS				

COMPONENT	PART	MANUFACTURER	MODEL #	# OF UNITS
ENCLOSURE FOR O ₃ AND FILTER PACK	Primary Enclosure	Stahlin	RJ1614HPL	2
	Mounting Panel (Aluminum)	Stahlin	BP1614AL	2
	Mounting Brackets	Various		1
SUBTOTAL ENCLOSURE FOR O₃ AND FILTER PACK				

The POMS II units are fabricated by the field support contractor, tested and shipped to the monitoring sites in several boxes disassembled. A technician, or in rare cases a site operator, assembles the POMS unit on-site and calibrates the weather sensors.

The 2B Tech ozone analyzers are calibrated at the field support contractors lab at the beginning of the season and again at the end of the season. Daily zero checks and instrument parameter data are used to assess the function and health of the instrument. All data is sent through the Orbcomm satellite modem and placed on an ftp site for retrieval by the field support contractor. Update transmissions are approximately hourly. Communication is one-way. The datalogger also retains the data and can be polled at the end of the season to recover all data.

The 2B Tech ozone analyzer has an internal datalogger that retains ozone, case temperature, and instrument pressure information. This data can be retrieved through a serial port to a PC computer using the Windows HyperTerminal program.

Options available for system configurations

Flexibility is part of the design for the portable ozone monitoring systems. The table below shows the options that are readily available and are possible configurations.

Table 2.

Base system	Pollutant measurements	Weather sensors	Communications	Power
Tripod tower*	Ozone analyzer*	Winds*	Cell phone	Solar panel, battery pack – DC*
Campbell datalogger*	CASTNet-style filter-pack (SO ₂ , NO ₃ , SO ₄ , HNO ₃)	Relative humidity**	Satellite modem*	AC line power
Instrument box*	eBAM or eSampler	Solar radiation**	Storage module	
Automated zero check system*		Ambient temperature*	Near real-time web data presentation	
Inlet with Teflon filter*		Rainfall*	Hard-line phone	
		Other sensors	Wireless digital modem	

* Standard configuration components