



# MARK II MICROSONDE™



ocean systems division

## FEATURES

- **DIGITAL DATA TRANSMISSION**
- **CAPACITIVE ANEROID PRESSURE SENSOR**
- **LIGHTWEIGHT- 300 GRAMS INCLUDING DEREELER AND CORD**
- **ALL SENSORS PRECALIBRATED AND PERMANENTLY INSTALLED**
- **MINIMAL LAUNCH PREPARATION**
- **MICROPROCESSOR BASED**
- **FOUR SPARE CHANNELS FOR RESEARCH APPLICATIONS**
- **ALL METEOROLOGICAL PARAMETERS SAMPLED ONCE PER SECOND**
- **DATA TRANSMITTED TWICE FOR ADDED RELIABILITY**

## GENERAL DESCRIPTION

The ZEEMET™ Mark II MICROSONDE series represents the state-of-the-art in radiosonde design. Compatible with the W-9000 Meteorological Processing System, these radiosondes are designed for low cost, automatic upper air soundings. The lightweight sonde (complete with internal dereeler, sonde cord, battery and calibrated sensors) facilitates one-man launch and allows the use of a smaller balloon, thus reducing operating costs. All Mark II MICROSONDES measure pressure (P), temperature (T), and relative humidity (U). Data from other sensors can be transmitted on the four spare channels. Mark II MICROSONDES are available for various methods of windfinding (GPS, Loran-C, radiotheodolite, radar, etc.).

## TECHNICAL DESCRIPTION

The Mark II MICROSONDE series of radiosondes utilizes microprocessor based technology and digital techniques to provide better data reliability and quality than previously available in analog radiosondes. All sensors are precalibrated at the factory and require no ground baseline check prior to launch. The instrument is powered by a single water-activated battery.

Temperature is measured with a small rod thermistor with improved time response. A carbon element measures relative humidity. Both sensors exhibit a variation in resistance with the parameter being sensed.

A capacitive aneroid provides highly accurate, continuous pressure measurement over the entire synoptic range. All meteorological parameters are sampled once per second throughout the flight.



Sensor information is transmitted in digital form at a 400 baud rate. The prior meteorological sampling is attached to the end of each new frame of data. If a frame of data is lost in transmission, the W-9000 system replaces the missing data using this redundancy feature.

The Mark II MICROSONDE series uses two methods to address the problem of radio frequency interference in the meteorological band. First, multi-stage transmitters at both 403 MHz and 1680 MHz frequencies provide highly stable signals over the entire range of operating temperatures. For critical applications, high stability transmitters are available. Secondly, the Mark II serial number is transmitted continuously in the digital data stream. This feature allows the W-9000 synthesized receiver to lock-on to the Mark II data transmission throughout the flight.

**PRESSURE MEASUREMENT**

The ZEEMET Mark II series of radiosondes features a capacitive aneroid for continuous pressure measurement. Precise manufacturing and calibration processes minimize effects due to temperature, hysteresis, and drift. Calibration information is encoded in the radiosonde EEPROM and transmitted continuously.

**TEMPERATURE MEASUREMENT**

A thin ACCU-LOK fast response rod thermistor is employed to measure temperature. The thermistor lock-in resistance value is part of the radiosonde data stream, eliminating the need for preflight baselining.

**HUMIDITY MEASUREMENT**

A small ACCU-LOK fast response carbon hygistor is utilized to measure humidity. The Mark II MICROSONDE includes an advanced duct design proven

to optimize the accuracy of humidity measurement. Each hygistor is permanently installed in the radiosonde; a protective vial is removed prior to launch to expose the sensor. Here again the lock-in values are included as part of the radiosonde data stream.

**WINDS**

The Loran-C Mark II MICROSONDE retransmits radionavigation signals to the W-9000 System. The W-9000 System then processes these signals into winds data. These Mark II MICROSONDES incorporate a low noise integrated circuit receiver tuned to the respective frequencies to amplify signals before applying them to the modulator/transmitter. Receiver gain is designed to pick up the weakest signal of Loran-C networks so that the sonde can be flown virtually anywhere suitable coverage is available.

The GPS Mark II MICROSONDE includes a full code correlating, all-in-view GPS receiver and antenna. The GPS receiver processes signals from all visible satellites and is integrated into the radiosonde electronics. Raw GPS data (LOS) from the receiver is encoded and added to the serial PTU data. The sum of these two data streams is then sent as a single digital transmission within the 400-406 MHz bandwidth. The W-9000 system receives, filters, decodes and processes these signals into accurate winds data.

**DEREELER**

The Mark II has an internal automatic dereeler (with 30 meters of cord) to facilitate launch in high winds, on board ship, or with only one operator. A centrifugal clutch governs the payout rate of the cord. The operator needs only to attach the cord to the balloon prior to launch.

**SPECIFICATIONS**

**TRANSMITTERS**

Nominal Frequency: 403 MHz  
Tuning Range: 400-406 MHz  
Frequency Stability over Entire Synoptic Range: 400KHz  
Output Power (Nominal): 240 mW  
Modulation: FM

Nominal Frequency: 1680 MHz  
Tuning Range: 1680-1700 MHz  
Frequency Stability over Entire Synoptic Range: 3 MHz  
Output Power (Nominal): 300 mW  
Modulation: FM

**DATA TRANSMISSION**

Type: Digital Bi-Phase  
Transmission Rate: 400 Baud  
Subcarrier (Loran) 100 kHz

**DATA CHANNELS**

Pressure, Temperature, Humidity plus 4 spare channels.

**SAMPLING RATE**

All parameters once per second. Each data set transmitted twice for added reliability.

**POWER SOURCE**

Single water-activated battery.

**SENSOR CALIBRATION**

Polynomial coefficients resident in sonde EEPROM are transmitted continuously in digital data-stream.

**PRESSURE SENSOR**

Type: Continuously variable capacitance aneroid  
Measuring Range: 1080 mb to 3 mb  
Accuracy: ±0.5 mb (rms)  
Resolution: 0.1 mb

**TEMPERATURE SENSOR**

Type: Thin rod thermistor  
Range: -90°C to +60°C  
Accuracy: ±0.2°C (rms)  
Resolution: 0.1°C

**HUMIDITY SENSOR**

Type: Carbon type  
Range: 5 to 100% RH;  
+40°C to -50°C  
Accuracy: 2% RH (rms)  
Resolution: 1% RH

**DIMENSIONS**

144 x 102 x 193 (mm)

**WEIGHT**

300 grams (including battery, dereeler, & cord)

**MODEL**

1540 1680 MHz, P,T, U  
1543 403 MHz, Loran-C/P,T, U  
1547 403 MHz, P,T, U  
1548 403 MHz, GPS

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*The VIZ Meteorological Systems Group of Sippican, Inc. has over 50 years of dedicated experience in the field of upper air meteorological equipment. Our background and experience in the development of radiosonde systems makes us a world leader in the market. This background and experience assures you that Sippican can provide upper air instrumentation to meet your specific requirements.*

**Sippican, Inc.**

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