

# RD93 GPS Dropwindsonde and Aircraft Data System

The RD93 is a general-purpose dropwindsonde for aircraft use. It is designed for high-altitude drops, and the Data System architecture supports four simultaneous dropsonde soundings. NCAR has developed this GPS dropsonde system in cooperation with German Aerospace Research Establishment, DLR, and with National Oceanic and Atmospheric Administration, NOAA. The production of the RD93 GPS Dropsonde and Aircraft Data System is licensed to Vaisala Inc.

## STRUCTURE

The GPS dropwindsonde RD93 incorporates a Vaisala RSS903 sensor module and a Vaisala GPS121 codeless GPS receiver module.



In addition to the RSS903 sensor module and the GPS121 receiver module, the dropsonde electronics board includes a microprocessor for interfacing the sensor module and forming the digital data transmission sequence.

The sonde can be connected to the Aircraft Data System via an RS-232 link for test and checkout and for setting the telemetry transmitter frequency. The transmitter can be set anywhere in the 400 MHz meteorological band in 20 kHz steps.

A unique square-cone parachute is used to reduce the initial shock load and to slow and stabilize the sonde. The parachute is immediately deployed on exit from the launch chute and streamers for about five seconds until filled by ram-air. The square cone parachute is very stable during the sonde's descent and reduces or eliminates any pendulum motions of the sonde.

## AIRCRAFT DATA SYSTEM

Reception of the signal transmitted from the sonde begins at a 400 MHz Telemetry Antenna mounted on the underside of the aircraft fuselage. The output signal from the preamplifier is connected to a 400 MHz Power Divider which feeds the amplified signal to all telemetry receivers. Similarly, a GPS antenna mounted on the topside of the fuselage receives the local GPS signals which are then amplified and distributed to a MWG201 GPS Processor.

The signal from the telemetry receiver is a stream of Manchester-encoded binary data containing both PTU and GPS data. This signal is fed to the input of a microprocessor-based PTU and GPS Frame Buffer board where it is decoded back into the two separate data sources and processed to a single ASCII message that is asynchronously transmitted via RS-232 to a serial port of the system PC.

The PC runs a high-level language application program that ingests the raw PTU and GPS data and computes the final data products.

## SONDE

Chassis interface	TTL Level
GPS Receiver Channel	track up to 8 satellites simultaneously
Transmitter	
Frequency range	400 MHz to 406 MHz
Frequency stability	±3 kHz
RF Power output	100 mW
Harmonic & spurious output	>50 dB below the carrier level
DC input current	~225 mA at +15 V DC
Digital deviation	>2 kHz, <2.5 kHz
GPS deviation	>2 kHz, <2.5 kHz
Total modulation	>2.5 kHz, <3.5 kHz
Battery	
Type	Lithium, six CR-2 cells
Voltage	+15 hours
Life	2 hours (operating), 3 years (shelf)
Pressure sensor	
Range	1080 hPa to 100 hPa
Resolution	0.1 hPa
Accuracy	
Repeatability (*)	0.4 hPa
Uncertainty in soundings (**)	1.5 hPa
Temperature sensor	
Range	+60 °C to -90 °C
Resolution	0.1 °C
Accuracy	0.1 °C
Repeatability (*)	0.1 °C
Uncertainty in soundings (**)	0.5 °C

## Relative humidity sensors

Range	0 % to 100 % RH
Resolution	1 %
Accuracy	
Repeatability (*)	2% RH
Uncertainty in soundings (**)	5% RH
Horizontal winds	
Range	0 m/s to 200 m/s
Resolution	0.1 m/s
Accuracy	±0.5 m/s
Antenna	
400 MHz impedance	50 Ω
Wavelength	1/4
Polarization	Vertical
Data rate	
PTU	over 0.5 second
Wind	over 0.5 second
Descent speed	~ 11 m/s at sea level



Internet:  
<http://www.vaisala.com>

**VAISALA Oyj**  
P.O.Box 26, FIN-00421 Helsinki  
FINLAND  
Phone: +358 9 894 91  
Telefax: +358 9 894 9227  
Telex: 122832 vsala fi

**VAISALA GmbH**  
Postfach 540267  
D-22502 Hamburg  
DEUTSCHLAND  
Phone: +49 40 858 027  
Telefax: +49 40 850 8444

**VAISALA (UK) Ltd**  
Suffolk House  
Fordham Road  
Newmarket  
Suffolk CB8 7AA  
UNITED KINGDOM  
Phone: +44 1638 674 400  
Telefax: +44 1638 674 411

**VAISALASA**  
3, Parc Ariane  
Saint-Quentin-en-Yvelines  
F-78284 Guyancourt Cedex  
FRANCE  
Phone: +33 1 3057 2728  
Telefax: +33 1 3096 0858

**VAISALA Inc.**  
100 Commerce Way  
Woburn, MA 01801 - 1068  
USA  
Phone: +1 781 933 4500  
Telefax: +1 781 933 8029

**VAISALAKK**  
42 Kagurazaka 6-Chome  
Shinjuku-Ku,  
Tokyo 162  
JAPAN  
Phone: +81 3 3266 9611  
Telefax: +81 3 3266 9610

**VAISALA Pty. Ltd**  
3 Guest Street  
Hawthorn, VIC 3122  
AUSTRALIA  
Phone: +61 3 9818 4200  
Telefax: +61 3 9818 4522  
A.C.N. 006 500 616

**VAISALA Beijing Representative Office**  
Room 518 - 520  
Wangfujing Grand Hotel  
No. 57 Wangfujing Street  
Beijing 100006  
PEOPLE'S REPUBLIC OF CHINA  
Phone: +86 10 6522 4050  
Telefax: +86 10 6522 4051