GPS Radiosonde

iMS-100

Outline

GPS radiosonde is an upper-air sounding instrument to measure various types of meteorological data; wind speed, wind direction, pressure, temperature and humidity. Wind speed, wind direction and pressure are calculated from the travel speed and altitude obtained by GPS positioning techniques. Every 1 second measured data are transmitted to ground receiving system via 400-406 MHz band.

Compact and commonly-used devices are aggressively adopted in iMS-100 to achieve downsizing (just only 38 g including one battery) and its cost reduction. iMS-100 also serves for total operation cost saving by using smaller balloon and reducing the gas amount depending on the target height. Furthermore, the lightweight package greatly enhances safety in the sounding operation even without parachute when it accidently falls down on land, especially.

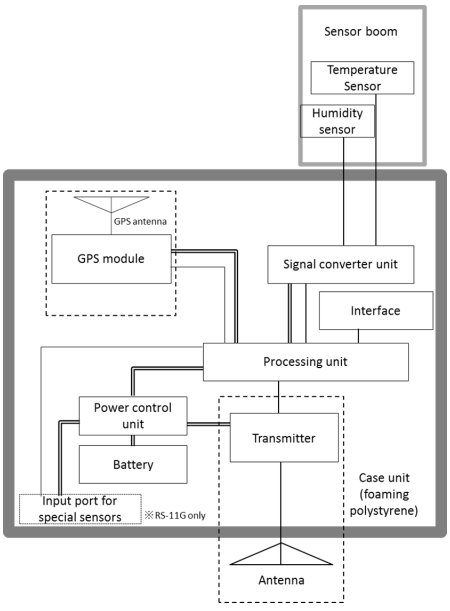
Improved sensor boom achieves higher accuracy in temperature measurement. Also, newly developed high response humidity sensor enables more accurate humidity measurement even in low temperature environment (below –40℃). In addition to the advantages of cost and safety, the innovative downsizing can minimize pendulum motions and heat contamination from the sonde itself during launch, which improves the measurement performances in terms of wind and temperature.

Features:

Compact & Light Weight Radiosonde

- **Much higher accurate measurements of temperature and humidity, wind for the upper-air soundings**
- **Light weight 38 g iMS-100 helps enhancing safe operation especially when it falls down to the ground.**
- **Tiny iMS-100 effectively reducing overall operational costs (smaller balloon, fewer gas consumption) depends on the target height**
- **Downsized iMS-100 can contribute to reduce environmental burden through the entire life cycle (manufacturing, transportation, storage, and disposal)**
- **One lithium battery enables more than 4 hours sounding operation.**
- **High stability transmitter complying with ETSI (EN 302 054 V1.1.1)**
- **Easy preparation through wireless infrared communication (IrDA) between radiosonde and sonde checker unit before launch**
- **Biomaterial package, which is environmental friendly, is optionally available**

Block Diagrams



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Specifications (Uncertainty evaluation*1)

Temperature	Measurement range	-95℃ to +60℃
	Resolution	0.1℃
	Uncertainty*2	Daytime: 0 to 16km : <0.5℃ Above 16km : <0.8℃ Night time: 0 to 16km : <0.4℃ Above 16km : <0.4℃
	Response time	< 0.4 s (1,000 hPa, 5 m/s)
Humidity	Measurement range	0%RH to 100%RH
	Resolution	0.1%RH
	Uncertainty*2	0 to 12km : <5%RH*3 12 to 17km : <5%RH
	Response time	< 0.2 s (Absorbing, 1,000 hPa, 6 m/s , 0℃) < 14 s (Absorbing, 1,000 hPa, 6 m/s, -60℃)
Pressure	Measurement range	1050.0 hPa to 3.0 hPa
	Resolution	0.1 hPa
	Uncertainty*2,4	1km : <1.2hPa 10km : <1.2hPa 16km : <0.5hPa 24km : <0.5hPa 32km : <0.13hPa
Geopotential Height	Measurement range	-500 m to 40,000 m
	Resolution	0.1 gpm
	Uncertainty*2,4	1km : < 11gpm 5km : <11gpm 10km : <11gpm 16km : <11gpm 20km : <11gpm 32km : <11gpm
Wind Direction	Measurement range	0° to 360°
	Resolution	0.01°
	Uncertainty*4,5	0 to 16km:<1°with speed<10m/s <1° with speed >10m/s Above 16km:<1°with speed<10m/s <1° with speed >10m/s
Wind Speed	Measurement range	0 m/s to 200 m/s
	Resolution	0.01 m/s
	Uncertainty*4,5	0 to 16km : <0.15m/s Above 16km : <0.15m/s
GPS Receiver	Frequency	1574.25 MHz ±1MHz L1-C/A code
	Number of channels	24 channels
	Positioning Technology	DGPS (SBAS)
Usage Environment	Pressure	1050.0 hPa to 3.0 hPa
	Temperature	-95℃ to +60℃
	Humidity	0%RH to 100%RH

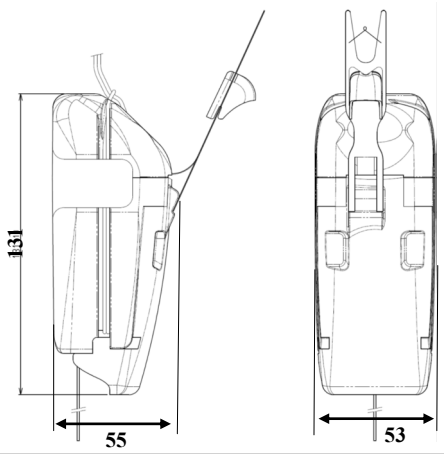
Transmitter	Center freq.	404.5 MHz
	Tuning range *6	400 MHz ~ 406MHz
	Band width	< 15 kHz
	Output power	< 100 mW
	Transmitter type	FM
	Standard	EN302 054 V1.1.1
Modulation	Modulation type	Digital PCM
	Baud rate	1,200 bps
	Range	>300 km (with Yagi antenna)
	Sampling	1 second
Power	Voltage	3.0 VDC
	Current	< 200 mA
	Battery type	Lithium battery × 1 (CR-123)
	Operating time	> 240 min.
Size & Weight *7	Dimensions	55(W)×53(D)×131(H) mm
	Weight (Including a battery)	38 g (EPS) 40 g (Bio-based package)*8
Accompanying items	Unwinder	10m/ 15m/ 30 m
	Balloon/parachute	Optional, please contact us.

Note

*1) The uncertainty values are calculated by the latest (April, 2016) JMA-GRUAN evaluation
*2) Expressed with coverage factor, k=2, unless otherwise explicitly specified.
*3) Expect rapid humidity change around tropopause
*4) Under optimal conditions of GPS reception : PDOP = 1
*5) 1σ statistical uncertainty evaluated with GPS simulator by using sonde sounding scenario
*6) Frequency can be changed every 100 kHz within the tuning range of 400 MHz and 406 MHz. Applicable Radio Law/Regulations should be complied.
*7) Dimensions excluding antenna and sensor boom. Weight includes a battery, etc.
*8) Bio-based material package type is optionally available.

Outline View

Unit (mm)



Cautions

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No. MSPA4-031 M1905

GROUND RECEIVER SYSTEM RD-18
w/ Sounding Software MGPS2

Features

- Easy installation (1 pole for outside equipment. 1 Ethernet cable between inside and outside)
  ＊Except for a coaxial cable for GPS rerepeater
- Three (3) steps to facilitate sounding operation
- Quick five (5) minutes preparation
  ＊The time to display the corrected data depends on the setting of the filter

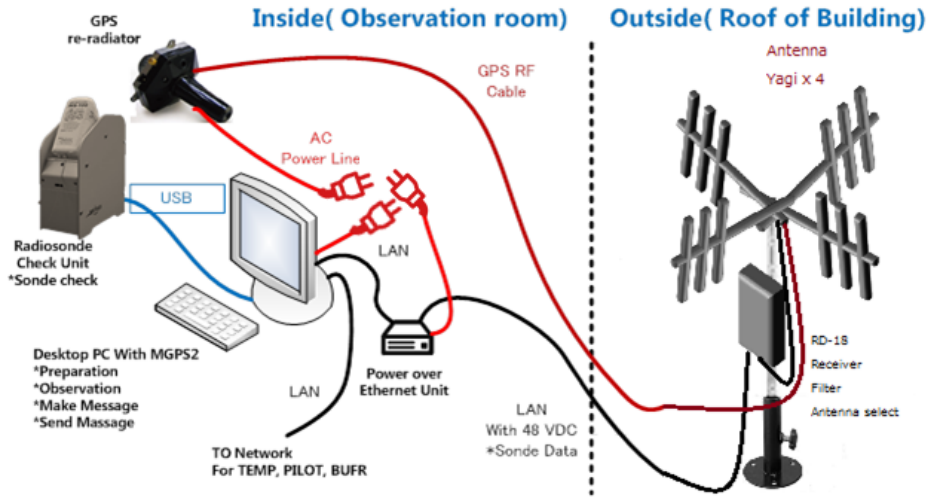
GPS Radiosonde Ground Receiver System efficiently responds to the operator's requirements for upper air sounding operation. The lightweight and simple system is allows easier installation.

Inside equipment consists of PC with sounding software MGPS2, sonde checker, PoE injector, GPS re-radiator.

MGPS2 is easy to use sounding software even for non-trained operator supporting preparation, sonde check, launch, data collection, analysis and various meteorological messages through interactive interface. In addition to fundamental charts, various applications are provided such as Emagram, Skew-T, Hodograph and so on. MGPS2 can also display the status of RD-18 receiver (the receiver frequency, signal strength and real time spectrum etc.). MGP2 can operate in any time zone (LST or UTC) and receives time information from the sonde synchronized with the GPS time and synchronizes the its time.

Outside equipment consists of 400MHz antennas (maximum 4) for radiosonde, RD-18 receiver and GPS antenna.

RD-18 receiver is installed beneath the antenna. RD-18 receives signal of the radiosonde, demodulates the signal, sends measured data to indoor PC by a Ethernet cable. RD-18 consumes less power and it is powered from PoE injector by the Ethernet cable. By selecting the PoE injector compatible with each country's power supply, it can be used in any power supply environment. RD-18 has backup capacitor inside, so it keeps working against momentary power failure. RD-18 also sends HK data (lock status, inside temperature and the status of power supply) to PC. RD-18 has other basic functions, such as antenna switcher, narrow 8ch band pass filter, AFC/MFC and real time spectrum measurement. RD-18 can receive the signal from radiosonde more than 250km away with Yagi antenna. Under low-temperature environment less than -20°C, it is possible to correspond up to -60°C by an optional external power supply and a heater.



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No.

Technical Data

RD-18 Receiver

Receiver	Frequency Range	400.2 to 406 MHz
	Channel step	100 kHz (60ch)
	Sensitivity	〈-107[dBm]
	Function	AFC, AGC
Demodulator	Modulation type	PCM-FM BiΦ
	Deviation	〈3.75kHz
	Speed	1200bps
	Band width	〈15kHz
	Error correction	BCH, 1bit error correction
Port	Antenna	4ch, N-Jack
	Data & Power	RJ-45
	Heater	2 pin connector
Preamp	Gain	〉20dB
	Filter	8ch BPF
		Band width: about 1MHz
Communication	to PC	LAN(10/100BASE-T)
Power	Voltage	48V DC
		by PoE injector
	Consumption	〈30W
		Option: 100W heater
		in cold area
	Extra	24V DC for optional heater
	Backup	1sec by backup capacitor
Indicator	Blue	Signal LOCK
	Green	Power On
	Red	HK Warning

Environmental condition	Temperature	-20～50℃
		-60～50℃ with optional heater
	Humidity	0～100%RH
	Wind speed	Up to 60m/s(Instantaneous)
	Precipitation	Unlimited
	Lightning	RF : SMA type
		DC discharge starting >DC120V
		Voltage protection level <700V
		Impulse durability 10kA(8/20us)
		LAN : RJ-45 type
		DC discharge starting >DC60V
		Voltage protection level <500V
		Impulse durability 5kA(8/20us)
Case	Water/Dust proof	IP65
	Material	Aluminum diecast
	Size	W240 x H 360 x D 120
	Weight	〈7kg
Other functions	Antenna switch	Max 4ch
	Spectrum search	Real time
Yagi antenna		
Gain		〉6.8[dBi]
Directionality	Vertical	±35°
	Horizontal	±45°
Frequency	center	403MHz
Impedance	Input	50ohm
Range		〉250km

Sounding software “MGPS2”

Display	PTU chart, Tracking chart, Ascent chart, Raw data, List table, Adiabatic diagrams (Emagram, Skew-T, Tephigram, Stuve diagram), Hodograph, Tu significant point editor, Wind significant point editor, WMO Messages monitor, GPS status monitor, Radio frequency setting
Meteorological Data (Range & resolution)	Temperature: -95 … +60°C, 0.1°C Humidity: 0 … 100%RH, 0.1°C Pressure: 1050.0hPa … 3.0hPa, 0.1hPa Geopotential height: -500.0m … 40000.0m, 0.1hPa Wind direction: 0.00° … 359.99°, 0.01° Wind speed: 0.00m/s … 200.00m/s, 0.01m/s
Meteorological Messages (WMO)	FM35 TEMP,FM36 TEMP SHIP, FM32 PILOT, FM75 CLIMAT TEMP BUFR 3’09’052 (for TEMP data) BUFR 3’09’050 and BUFR 3’09’051 (for PILOT data)
Meteorological messages (Military)	METCM, METB, METFM, METSR, METTA, METEO 11
Language	English, Spanish, Turkish and Japanese

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