Anexo I

HUMICAP
Sensores de Humedad y Temperatura

HMP45A&HMP45D HUMIDITY AND TEMPERATURE PROBES Operating Manual

U274en-1.2
29 September 1997

1. GENERAL

The HMP45A and HMP45D probes are designed for the measurement of relative humidity and temperature. Humidity measurement is based on the capacitive thin film polymer sensor HUMICAP®180. Temperature measurement is based on resistive platinum sensors (Pt 100 and Pt 1000). Both the humidity and temperature sensors are located at the tip of the probe and in standard version protected by a membrane filter. The HMP45A and HMP45D have a similar humidity output, but the temperature output is active in HMP45A (voltage output 0-1V) and passive in HMP45D (resistive output Pt 100).

2. CONNECTIONS

The cable wires are connected as shown in Figure 1.

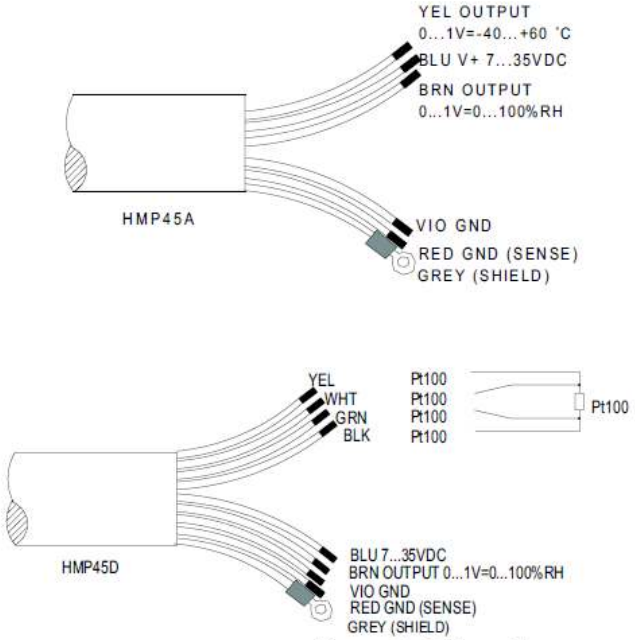


Figure 1 Wire colours

SIGNAL GROUND is used for output signal in a differential measurement. With SIGNAL GROUND, the cable can be extended up to 100 metres without disturbing the measurement accuracy. When outputs are not measured against SIGNAL GROUND, connect GROUND and SIGNAL GROUND to the same point.

3.3 Changing the HUMICAP®180 humidity sensor

Unscrew the filter. Remove the damaged sensor and mount a new HUMICAP®180 humidity sensor in its place. Handle the sensor with care. Calibrate the probe using a two-point calibration procedure. Note that if the probe is not calibrated, the accuracy is still better than ±7 %RH.

4. SPARE PARTS AND ACCESSORIES

Order code	Description
HUMICAP®180	Humidity sensor
18921	Temperature sensor Pt 1000 IEC 751 1/3 Class B (HMP45A)
19159	Temperature sensor Pt 100 IEC 751 1/3 Class B (HMP45D)
2787HM	Membrane filter (standard)
6685	Sintered filter 37 µm
6686	Sintered filter 216 µm
6597	Plastic grid
HMP45ASP	HMP45A probe head
HMP45DSP	HMP45D probe head
HMH45ASP	Probe handle for HMP45A and HMP45D
HMI41	Humidity and temperature indicator
HMH45	Probe handle for HMP45A with a connector to HMI41
HMK11	Humidity Calibrator
HMK13B	Humidity Calibrator

5. TECHNICAL DATA

5.1 Humidity (HMP45A & HMP45D)

Measurement range	0.8...100 %RH
Output scale	0...100 %RH equals 0-1 VDC

Accuracy at +20 °C (including non-linearity and hysteresis):

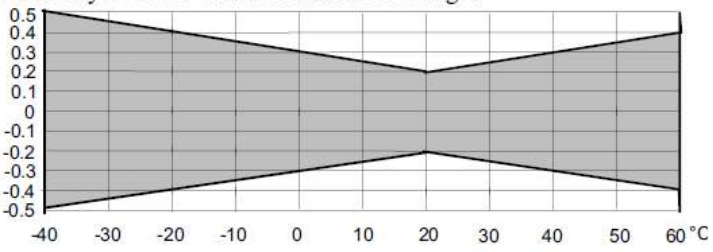
against factory references	±1 %RH
field calibration against references	±2 %RH (0...90 %RH)
	±3 %RH (90...100 %RH)
Typical long-term stability	better than 1 %RH per year
Temperature dependence	±0.05 %RH/°C
Response time (90%) at +20 °C	15 s with membrane filter
Humidity sensor	HUMICAP®180

5.2 Temperature

HMP45A

Measurement range	-39.2...+60 °C
Output scale	-40...+60 °C equals 0...1 VDC
Accuracy at 20°C	±0.2 °C

Accuracy over the whole measurement range:



Temperature sensor	Pt 1000 IEC 751 1/3 Class B

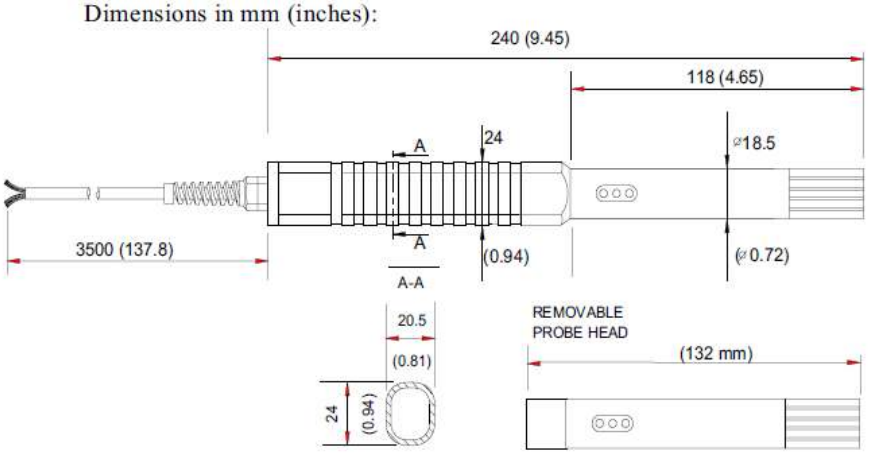
HMP45D

Measurement range	-40...+60 °C
Output signal	resistive four wire connection
Temperature sensor	Pt 100 IEC 751 1/3 Class B

5.3 General

Operating temperature range	-40...+60 °C
Storage temperature range	-40...+80 °C
Supply voltage	7...35 VDC
Settling time	500 ms
Power consumption	< 4 mA
Output load	>10 kohm (to ground)
Weight	350 g (including package)
Cable length	3.5 m
Housing material	ABS plastic
Housing classification (electronics)	IP 65 (NEMA 4)
Sensor protection (standard)	membrane filter, part no. 2787HM

Dimensions in mm (inches):



5.4 Electromagnetic compatibility

5.4.1 Emissions

Radiated interference, test setup according to EN55022

5.4.2 Immunity

Test:	Test setup according to:	Performance:
Radiated interference	IEC 1000-4-3	HMP45A level 1 (3V/m) HMP45D level 3 (10 V/m)
Electrostatic discharge	IEC 801-4	level 4 (HMP45A&D)

CE

GUARANTEE

Vaisala issues a guarantee for the material and workmanship of this product for one (1) year from the date of delivery. Damage due to exceptional operating conditions, careless handling or misapplication will void the guarantee. Detailed warranty information is given in the Warranty and the Standard Conditions of Sale of Vaisala Oy.

Anexo II

KVW, Compás Electrónico

1. Installation Instructions

1.1 Parts List

The C100 electronic compass consists of a detachable toroidal fluxgate sensing element and a small electronics board.

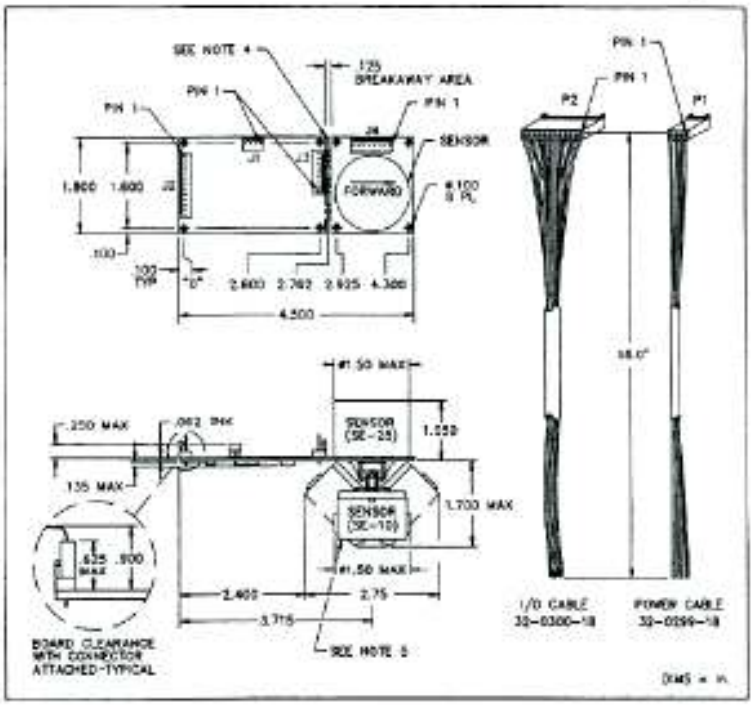


Figure 1. C100 Outline Drawing

Note

1. 18" #24AWG leads supplied with pins crimped and inserted and into mating connector. Remove or cut unused wires from connector.
2. Component height: Bottom of PCB: .135" max, Top of PCB: .250" max.
3. Connector Identification: J1 - Power Input, J2 - I/O Data and Control, J3 - Coil, J4 - Coil (If coil board is separated use optional jumper cable between J3 and J4).
4. To separate the coil board from the circuit board, carefully bend the breakaway joint until the two boards snap apart. Caution: Do not flex electronics board.
5. The SE-25 sensor is standard. The gimbaled SE-10 sensor is a no charge option.
6. Cut gray wire at P2 if strobe is not used. If strobe is used, run strobe wire separately from TXD and RS232-in wires.
7. Remove or cut unused wires from P2.

1.1.1Sensor Type

Two fluxgate sensors are available.

The SE-25 is the standard sensor provided with the C100. The C100 should be mounted in a level attitude in the host system. This sensor will operate through tilt (pitch and roll) ranges of ±16°.

The SE-10 is a gimbaled sensor which will operate through ±45° of tilt (pitch and roll). Its circuit board should also be mounted in a level attitude for optimum tilt performance.

A housed version of the C100 with the SE-25 sensor is also available.

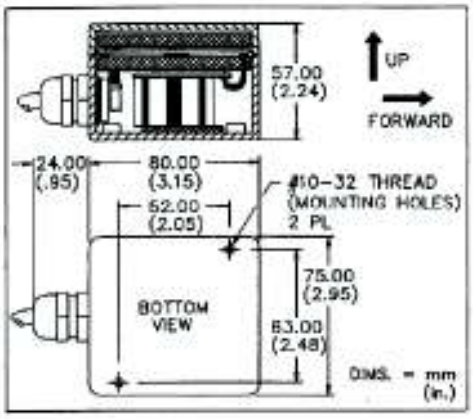


Figure 2. Outline Drawing Housed Version

Following are step-by-step instructions for correct installation. Make sure that whomever is going to install your C100 is familiar with these installation instructions and understands the principles of installation that ensure your sensor has the precision, convenience and usefulness for which it is designed.

1.2 Choosing a Location

Although the C100 can compensate for moderate magnetic interferences, it is important to select a location on the host platform that has the least amount of magnetic interferences. Place the C100 as far away as possible from iron, steel, magnets, motors, and other magnetic material. As a general guideline, a minimum separation of 12 inches should be maintained.

For installation that requires a remotely located sensor, the C100 circuit board is constructed so that the sensor circuit board can be separated from the electronics circuit board. This is easily done by placing a thumb on each side of the break-away joint and carefully bending, until the two boards snap apart.

Caution Do not flex the electronics circuit board. Support the boards so that the stress is applied only to the break-away joint. Be careful not to damage the fine wires on the coil assembly when handling this unit.

A six inch cable is provided with each C100 compass, unless otherwise specified. Optional cable assemblies up to 48 inches long are available from KVH. The shortest possible cable should be specified to minimize noise pickup in the sensor cable.

For installation near severe hard iron magnetic interference, the offending component can be shielded with a Mu Metal housing. However, some physical separation must still be maintained between the Mu Metal housing and the compass sensor. Since Mu Metal is a form of soft iron interference, comprehensive tests must be made to determine if the Mu Metal changes its magnetic signature over time and operational modes of the host system.

While the C100 can compensate for moderate deviations in a stable magnetic environment, it cannot compensate for magnetic interference that changes. Remember that wires carrying DC current generate a magnetic field. If the DC current changes, the field changes! Battery packs can be another source of changing interference. Every installation is different and the user must evaluate the installation under all expected operating conditions.

1.2.1 Overload Condition

When the compass sensor is exposed to a magnetic field outside of its operational range (either too high or too low) it will indicate this condition in the following way:

1. Serial Port

   - NMEA message will indicate a heading of 800.0
   - KVH message field will indicate "**OL**"
   - x and y message will not have an error flag

2. Digital Port

   - The digital output will indicate 800.0 for degrees and 8000 for mils in the Binary, BCD, and Gray Code Modes. No overload indication is provided in the C100 display or NCSC (CORDIC) Modes.

3. Analog Port

   - The sine, cosine, and reference outputs will all indicate the reference voltage (i.e. 1.5 VDC).

   - The linear output voltage will change, even if the compass is in the overload condition.

1.3 Mounting the C100

Figure 1. C100 Outline Drawing, page 1, shows the mounting details and the forward orientation of the compass during factory calibration. Either the center of the mounting holes or the edge of the circuit board can be used to orientate the C100 in the host system.

If the sensor cannot be physically aligned with the forward axis of the host system, the C100 can be programmed to cancel any offset using the index error offset feature.

Similarly, the local variation (declination) value can be entered so that the C100 will output true headings. The index and variation corrections are separate and independent functions in the C100.

Figure 2. Outline Drawing Housed Version, page 3, shows the outline drawing for the housed C100.

Note

When any feature of the C100 is selected (such as index offset), the C100 will store this in nonvolatile (EEPROM) memory. When the C100 is again powered up it will remember all the last programmed settings.

1.4 Making the Connections

1.4.1 Standard Units (without housing)

Table 1 defines the Power (P1) and Data I/O (P2) connector interface connections of the C100. All ground terminals are connected together on the circuit board.

Note

The Data I/O connections are functionally grouped and the pin numbers are not sequential.

Refer to *Figure 1. C100 Outline Drawing*, page 1, for connector locations.

We recommend that the serial, digital, and analog output wire groups be either run separately (physically isolated), or run in separate shielded cables using braided shields. The shield should be connected to ground at the I/O Connector (P2) only.

Table 1. C100 Interface Wiring - SE-25 and SE-10 Sensor (Standard Unhoused Units)

Function	Signal	Wire Color	Connector
Serial I/O Port	RXD, RS232 or 0 to +5V Data Input	Yellow	P2-4
	TXD, RS232 or 0 to +5V Data Output	Pink	P2-11
	Inverted TXD, 0 to +5V Data Output	Tan	P2-12
	Gnd, Common Ground	Black	P2-6
Digital I/O Port	Clk, 10kHz 0 to +5V Clock Output	Blue	P2-10
	Data, 0 to +5V Data Output	White	P2-9
	Strobe, 0 to +5V Strobe Input	Gray	P2-8
Analog Outputs	Sin, Sine or Analog Output	Orange	P2-3
	Cos, Cosine or Analog Output	Red	P2-2
	Ref, Reference or Analog Output	Brown	P2-1
	Gnd, Common Ground	Green	P2-5
Power Inputs	+8 to +18 VDC	White	P1-2
	+18 to +28 VDC	Red	P1-1
	Gnd, Common Ground	Black	P1-4

1.4.2Aluminum Housed Unit (SE-25 sensor)

Table 2 defines the Power and Data interface connections for the housed C100 electronic compass.

Note

The wire colors are different from Table 1.

Table 2. C100 Interface Wiring - SE-25 Sensor (Housed Unit Only)

Function	Signal	Wire Color
Serial I/O Port	RXD, RS232 or 0 to +5V Data Input	Red/Black Tracer
	TXD, RS232 or 0 to +5V Data Output	Blue/Black Tracer
	Inverted TXD, 0 to +5V Data Output	Blue/White Tracer
	Gnd, Common Ground	Black/White Tracer
Digital I/O Port	Clk, 10kHz 0 to +5V Clock Output	Blue
	Data, 0 to +5V Data Output	Orange/Black Tracer
	Strobe, 0 to +5V Strobe Input	Green/Black Tracer
Analog Outputs	Sin, Sine or Analog Output	Orange
	Cos, Cosine or Analog Output	Green
	Ref, Reference or Analog Output	White/Black Tracer
Power Inputs	+8 to +18 VDC	White
	+18 to +28 VDC	Red
	Gnd, Common Ground	Black
Not Used		Green/White Tracer
Not Used		Red/White Tracer

The cable shield is connected to the aluminum housing.

Figure 4. Standard Linear Output shows the regular linear output response.

Note

At 000° heading the output switches abruptly from 1.9 VDC to 0.1 VDC when turning clockwise. When turning counterclockwise, the output voltage will switch from 0.1 VDC to 1.9 VDC.

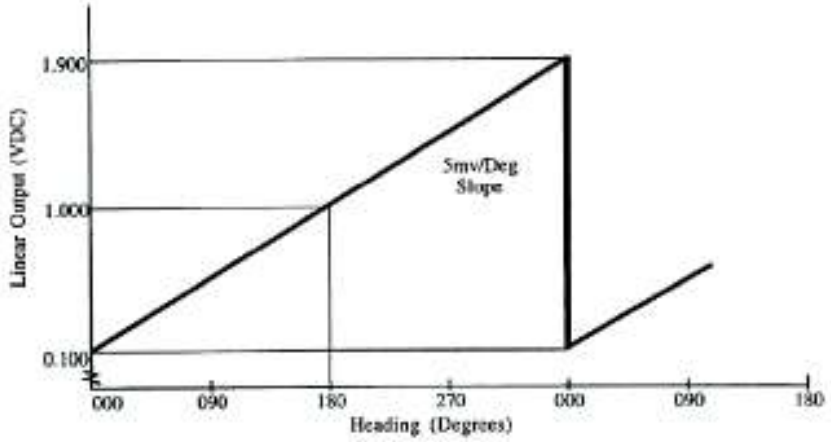


Figure 4. Standard Linear Output

Appendix C. C100 User Commands

C.1 Introduction

The following is a brief description that will tell the user how to use the "C100". For detailed information, refer to the C100 Technical Manual.

C.1.1 Power Connections

Power is located on the 4 pin Molex™ connector and has the following connections:

Pin 1 (RED) Power input +18 to +28 Volts
Pin 2 (WHT) Power input +8 to +18 Volts
Pin 3 (GRN) No connection
Pin 4 (BLK) Ground

The red and white wires on the 4 pin Molex™ connector are the power inputs, only "one" input can be used. **Do not connect both inputs at the same time.**

The black wire is the power's return (ground).

Once you have connected to your power supply, the unit will start running automatically. If it is the first time the unit has been powered up since you received it from the factory, it will power up with the factory standard default settings. Custom defaults can be provided on request. Refer to *Section 2.1 Default Values*, page 18, for the standard default settings.

If it is not the first time the unit has been powered up, then the unit will power up with the last configuration saved when the unit was powered down.

C.1.2 I/O Connections

The 12 pin Molex™ connector contains input and output connections that are used to communicate with, or get information from, the compass.

Pin 1 (BRN) Reference voltage for sine cosine output
Pin 2 (RED) Cosine output
Pin 3 (ORG) Sine output
Pin 4 (YEL) RS232 input for serial port
Pin 5 (GRN) Ground
Pin 6 (BLK) Ground
Pin 7 No connection
Pin 8 (GRY) Strobe input for digital port
Pin 9 (WHT) Data output for digital port
Pin 10 (BLU) Clock output for digital port
Pin 11 (PNK) Txd, Transmit data output for serial port
Pin 12 (TAN) Inverted Txd, Transmit data output for serial port

C.2 Programming the RS232 Compatible Serial Port

The <cr> stands for a carriage return or enter key.

In the message listings below, there is an implied carriage return <cr> after all the messages, a prompt character (>) indicates that the message was accepted or an exclamation character (!) indicates that the message was not accepted.

To accommodate a broad range of terminals and communication protocols, an ASCII "line feed" character (0x0a, transmitted by user) will be accepted by the communications message handler in the C100, but it will be ignored.

If the command sent to the compass has a * and two checksum characters (plus **cr** and **lf**) in the message, the command will be checksummed by the compass. The checksum includes from the first character up to the *, but not including the *. If the first character is a **$**, it would not be included in the checksum. The checksum is calculated by XOR'ing the ASCII bytes. The checksum is two ASCII bytes. The MSB is sent first. If the message read by the compass does not agree with the checksum received, the compass would send a "#!" and no data will be sent.

Anexo III

Gill, Anemómetro de Viento Sónico

WindSonic

User Manual

Doc No. 1405-PS-0019
Issue 15

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1 FOREWORD

Thank you for purchasing the WindSonic manufactured by Gill Instruments Ltd. The unit has no customer serviceable parts and requires no calibration or maintenance. To achieve optimum performance we recommend that you read the whole of this manual before proceeding with use. Do NOT remove black "rubber" transducer caps.

Gill products are in continuous development and therefore specifications may be subject to change and design improvements without prior notice.

2 INTRODUCTION

The Gill WindSonic wind sensor is a very robust, lightweight unit with no moving parts, outputting wind speed and direction. The units of wind speed, output rate and formats are all user selectable.

The WindSonic can be used in conjunction with a PC, datalogger or other device, provided it is compatible with one of the standard communication formats provided by the WindSonic.

WindSonic (option 2 or 3 only) is designed to connect directly to the Gill WindDisplay unit to provide a complete wind speed direction system without any configuration by the user.

WindSonic (options 1, 2 and 3) may be configured using WindCom software which is available, free of charge, from the Gill website www.gill.co.uk.

WindSonic (option 4) SDI-12 may not be re-configured in any Gill output format.

The output message format can be configured in Gill format, in Polar or UV (2-axis) format, and to either Polled (requested by host system) or Continuous output. Alternatively, it can be configured in NMEA (0183 Version 3) or SDI-12 (V1.3). These are described in Section 9 MESSAGE FORMATS and Section 11 SDI-12 COMMANDS.

3 FAST TRACK SET-UP

If you are in a hurry to try out the WindSonic (options 1, 2 or 3) and are familiar with Gill equipment and coupling to a PC using RS232, go to the following sections :

- Section 7 INSTALLATION
- Section 9 MESSAGE FORMATS
- Section 10 CONFIGURING

After you have successfully set up the WindSonic, we strongly advise that you then go back and read the rest of the manual to ensure that you get the best results from the WindSonic.

WindSonic Doc No 1405 PS 0019 Issue 15 August 2006

4 PRINCIPLE OF OPERATION

The WindSonic measures the times taken for an ultrasonic pulse of sound to travel from the North transducer to the South transducer, and compares it with the time for a pulse to travel from S to N transducer. Likewise times are compared between West and East, and E and W transducer.

If, for example, a North wind is blowing, then the time taken for the pulse to travel from N to S will be faster than from S to N, whereas the W to E, and E to W times will be the same. The wind speed and direction can then be calculated from the differences in the times of flight on each axis. This calculation is independent of factors such as temperature.

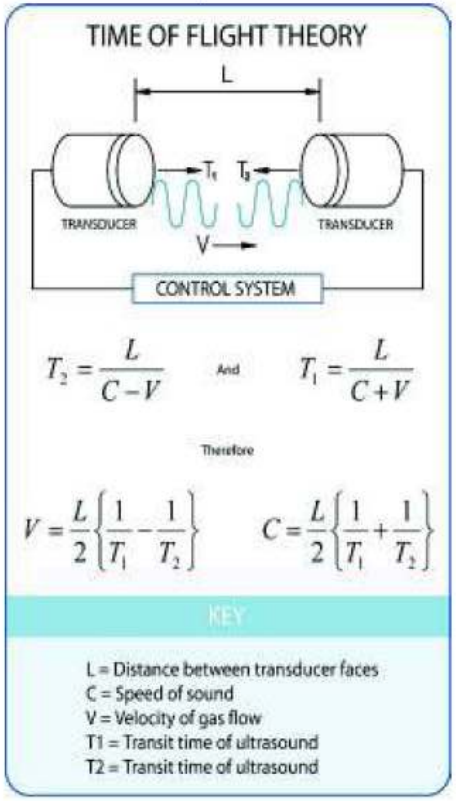

Figure 1 Time of Flight details

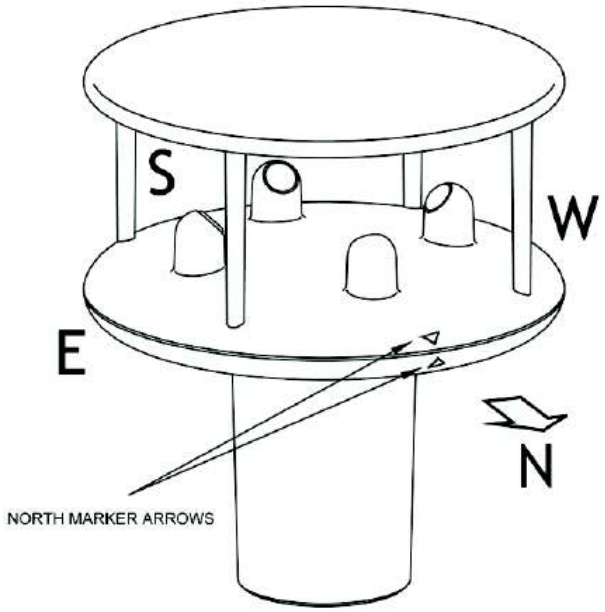

Figure 2 Compass Points

WindSonic Doc No 1405 PS 0019 Issue 15 August 2006

5 SPECIFICATION

Output		
Units of measure	Metres/second (m/s), Kilometres per hour (kph),	Knots, Miles per hour (mph), Feet per minute (fpm)
Output frequency	1, 2, or 4 outputs per second	
	Digital	Analogue
Parameters or	Polar - Speed and Direction UV - 2 axis, signed Speed	Polar - Speed and Direction Tunnel - U Speed and U Direction
Wind Speed		0 – 5m/s, 0 – 10m/s, 0 – 20m/s,
Range	0 – 60 m/s	0 – 30m/s, 0 – 50m/s, 0 – 60m/s,
Accuracy	± 2% (at 12m/s)	± 2% (at 12m/s)
Resolution	0.01 m/s	0.01 m/s
Wind Direction		
Range	0 - 359°	0 - 359 ° or 0 - 539° (Wraparound mode)
Accuracy	± 3° (20m/s)	±3° (at 20m/s)
Resolution	1°	1°
Analogue output formats		
0-5V 4-20mA	± 1% of full scale N.B. Analogue output impedance = 1KΩ	
Digital output formats		
Gill	Continuous or Polled (output on request by host system) Polar (Speed and Direction) or UV (2 axis, signed Speed)	
Marine – NMEA	NMEA 0183 version 3	
Data Logger	SDI-12 V1.3	
Communication formats		
WindSonic Option 1	RS232	
WindSonic Option 2	RS232, RS422, RS485	
WindSonic Option 3	RS232, RS422, RS485, and Analogue (0 – 5V or 4 – 20mA)	
WindSonic Option 4	SDI-12 Note: WindSonic Option 4 is not compatible with WindCom	
Anemometer status	Status OK and Error codes included as part of standard output message	
Environmental		
Moisture protection	IP65	
Temperature	Operating -35°C to +70°C Storage -40°C to +80°C	
Humidity	Operating <5% to 100%	
EMC	EN 61000-6 - 3 (Emissions) EN 61000-6 - 2 (Immunity)	
Standards	Manufactured within ISO9001: 2000 quality system	

Anexo IV

ZENO-3200 Datalogger

ZENO®-3200
User Manual

Version V2.02
June 27, 2003

P/N: 0302116012, Revision C

Michael J. Hart (Software Engineer)

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1. INTRODUCTION

Coastal Environmental Systems

ZENO®-3200 User Manual

1.1. WHAT IS THE ZENO®-3200?

The ZENO®-3200 is the world's first intelligent, versatile, low-power, 32-bit data acquisition system designed to collect, process, store and transmit data from multiple sensors. Its mechanical versatility and low power requirements allow the ZENO®-3200 to operate independently and remotely in a wide range of environmental extremes that include polar ice sheets, ocean buoys and windy mountaintops.

The ZENO®-3200's advanced firmware, ZENOSOFT®, contains extensive libraries of sensor types, data processes, and data output options that allow each ZENO®-3200 to be configured to meet a variety of requirements. The built-in, help-assisted menus contained in ZENOSOFT® let you configure the ZENO®-3200 with ease. The ZENOSOFT® libraries are continually being expanded. Contact Coastal Environmental Systems if your particular application is not discussed in this User Manual.

The related Intercept™ program[1] collects, displays, and forwards all data from the ZENO®-3200. Through Intercept™, data can be directly shared with other Microsoft Windows™ application programs. for further information, please refer to Coastal Environmental Systems' Intercept™ documentation.

1.2. HOW DOES THE ZENO®-3200 WORK?

The ZENO®-3200 carries out three primary functions via its built-in firmware, ZENOSOFT®, in a regular and timely fashion according to the configuration defined within the ZENO®-3200 memory:

1. Collect data from the sensors.
2. Process the collected data.
3. Log into RAM and/or transmit the processed and collected data.

ZENOSOFT® operates within a Real Time Operating System (RTOS) that is controlled by the ZENO®-3200's built-in clock. The RTOS allows multiple tasks to be performed concurrently and deterministically by the ZENO®-3200's single Central Processing Unit (CPU). This ensures that the ZENO®-3200 precisely performs its primary functions in accordance with the user's instructions stored in the configuration.

The ZENO®-3200 configuration is a set of information created by the user that tells the ZENO®-3200:

- How many sensors to collect data from.

[1] Intercept™, produced by Coastal Environmental Systems, is a Microsoft Windows™ application.

- What each sensor is.
- When to collect the data from each sensor.
- How to process the collected data.
- Which data values define a single data record to be logged into logging memory.
- When to log into memory and/or transmit the data record.
- Whether to generate one or more alarm messages.
- Which telephone numbers to dial (up to 4 telephone numbers), if an alarm message is to be sent via a telephone modem.
- What (if any) types of communication devices are connected to the ZENO®-3200 (a one-way radio, two-way radio, telephone modem, cellular modem, GOES or ARGOS transmitter).

To define the configuration within the ZENO®-3200 (and to retrieve data logged), the user interactively communicates with ZENOSOFT® using its built-in user interface. The user interface contains a set of interactive menus that allow the user to create a new configuration or modify an existing configuration.

1.3. ZENO®-3200 SPECIFICATIONS

1.3.1. Analog Inputs

Seven (7) differential or fourteen (14) single-ended inputs offer choices for sampling performance.

- Ultra-high resolution: ±18-bit at up to two channels/second with 50/60 Hz noise rejection.
- High resolution: ±15-bit at up to 10 channels/second with 50/60 Hz noise rejection.
- Low resolution: Two (2) channels available at ±12-bit A/D at 10,000 conversions/second.

Accuracy and linearity are provided over a wide temperature range as follows:

- Linearity: ±0.001% (-40°C to +60°C).
- Basic radiometric accuracy: ±0.05% (-40°C to +60°C).
- Wide dynamic input range: ±5 mV to ±5 V in 10 ranges.

All analog inputs are fault-protected against shorts, overvoltages, transients and ESD.

- Up to four multiplexer boards can be added, each allowing 32 additional single-ended or 16 differential inputs.

1.3.2. Digital I/O Ports

- Six (6) Schmidt trigger conditioned inputs.
- Two (2) comparator inputs.
- Six (6) general purpose input or output channels (inputs TTL with pull up resistor, outputs 1 - 5 VDC high impedance).
- One (1) switch closure (event counter).

Digital inputs can be configured for frequency, period, count, or event counting. Digital outputs can provide control or alarm signals.

- Count inputs: Up to 65536 counts at 0.005% accuracy.

- Frequency inputs: Up to 100 kHz at 0.005% accuracy.

1.3.3. Sensor and Auxiliary Power Outputs

- Sensor excitation: Five switched excitation outputs for software selectable voltages of 1.25, 2.50, 5.00, with basic accuracy of 0.01% at up to 100 mA. Long-term stability of 20 ppm over 1000 hours, with most of the drift occurring within the first 100 hours.
- Reference outputs: one fixed, for sensor signal offsets.
- Power outputs (switched).
- Three channels of +12V; one channel at 700 mA; two channels at 150 mA.
- Two channels of +5V at total 600 mA peak, 200 mA mean.
- Other power output: optional.
- Optional digital-to-analog expansion board gives 4 or 8 channels of individually programmable 12-bit analog output at 0 to 5 V. [2]

1.3.4. Serial Communication Ports

- Three serial communication ports labeled as COM1, COM2 and COM3.
- Baud rates: each serial communications port supports baud rates of 300, 600, 1200, 2400, 4800, 9600 and 19,200 bits per second (bps).
- COM1 supports RS232, RS232H [3], and unidirectional and bi-directional radio communications.
- COM2 supports RS232, RS232H, RS485, GOES satellite transmitters[4] and ARGOS satellite transmitters.[5] COM2 is fully multiplexed.[6]
- COM3 supports RS232, RS232H, RS485 and RS422.

1.3.5. ADC Conversion Rates

The ZENO®-3200 has two A/D converters: one referred to as 12-bit, and one referred to as 18-bit. The 12-bit ADC is very fast, with up to 10,000 samples per second. The main limitation on your use of the 12-bit ADC is the fact that only two terminal block connections are available.

A single conversion on the 18-bit ADC requires approximately 100 milliseconds, which equates to 10 samples per second. This always outputs a signed 18-bit value, but the least significant 3 bits are highly susceptible to noise and may not be accurate. Hence, a single sample has 15-bit accuracy. To obtain full 18-bit accuracy, three values must be averaged by setting the Sensor Sample Count in the Sensor Menu to three.[7] This brings the sample rate down to no more than three samples per second.

Therefore, the maximum possible sample rate -- including all sensors -- is a total of 16 samples per second at an effective 15 bits of resolution, or 2 samples per second at a full 18 bits of resolution.

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[2] Other voltage ranges are optional.
[3] RS232H is half-duplex RS232.
[4] Refer to Section 6.7.
[5] Refer to Section 6.8.
[6] Refer to Section 6.1.
[7] Refer to Section 10.3.1.

In practice, the best available sample rate is often rather lower than this. If multiple sensors are being read, with different excitation voltages or powers, the ZENO®-3200 must wait for the system to settle before beginning a conversion. Because the ZENO®-3200 is a multi-tasking system®, if a great deal of processing or message-transmission is required, then the CPU cannot revisit the ADC task immediately once each conversion is complete. A typical maximum sample rate is 10 samples per second at 15 bits.

2. ZENO®-3200 BASICS

Coastal Environmental Systems

ZENO®-3200 User Manual

2.1. THE ZENO®-3200 FRONT PANEL

The ZENO®-3200 Front Panel, illustrated in , allows easy access to nearly all external connections to the ZENO®-3200.

Only a 1/8-inch screwdriver[9] is required to attach wires to connections along the four terminal strips. The four terminal strips organize the external connections into the following groups:

- Analog Outputs and Grounds
- Analog Sensor Inputs
- Serial Data, Power and Grounds
- Digital Inputs and Outputs

The Serial Communications Port that is usually used for computer access, COM3 (a two-row, 9-pin, DE-9 connector), is located on the top, far right-hand side of the front panel. COM3 is sometimes referred to as the Maintenance Port.

The Auxiliary Serial Port (the two-row, 25-pin, DB-25 connector) is located to the left of COM3. Various connections for radio communication (both RS232 and TTL) as well as standard RS232 communications are available on this port. (Details about this port are located in Section 13.5.2 of this User Manual.)

The Analog Expansion Port, (the two-row, 15-pin, DA-15 connector), located on the top, far left-hand side of the front panel, is currently not in use.

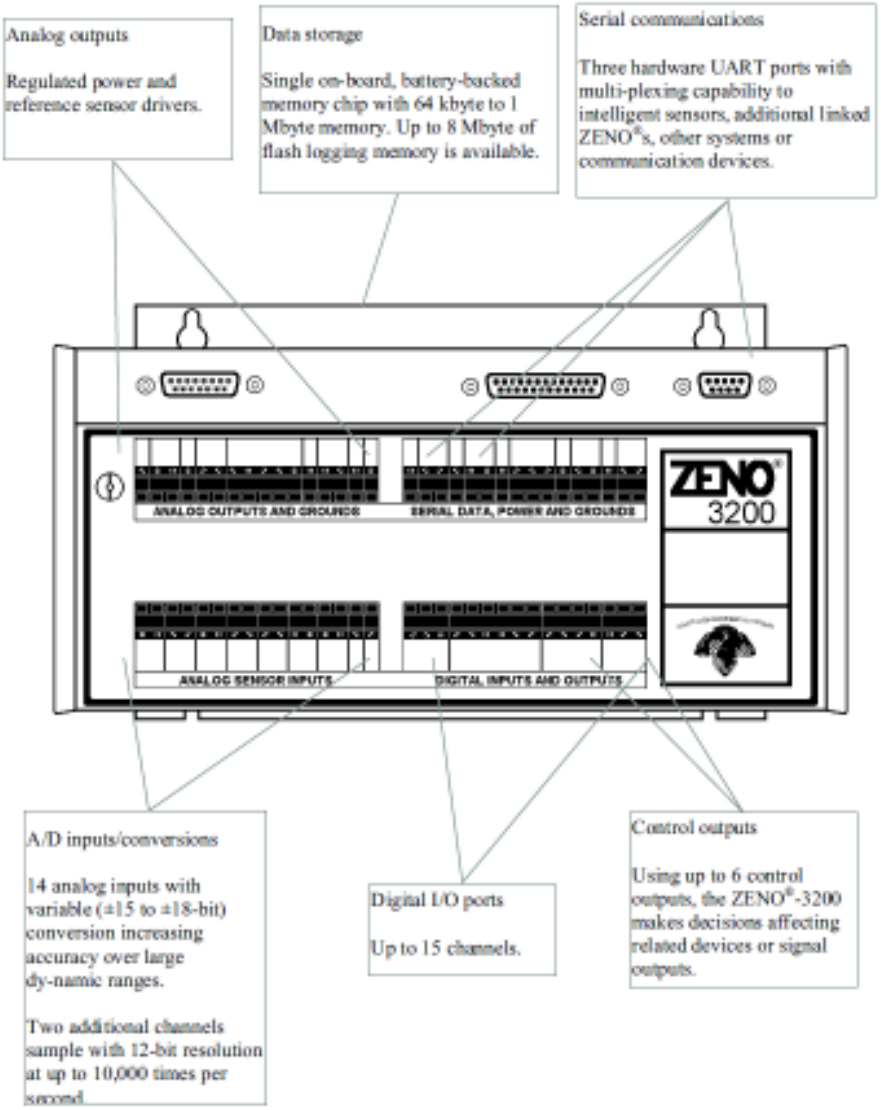

Figure 2-1. ZENO®-3200 Front Panel Diagram

2.2. COMMUNICATING WITH AND POWERING UP THE ZENO®-3200

You will need four things to begin communicating with ZENO®-3200:

1. Communication with the ZENO®-3200 is done via a PC, a Macintosh or any other computer running a standard, commercially available terminal emulation program (such as Crosstalk, Mirror, Microsoft Windows® Terminal, Microsoft Windows® Hyperterminal, or ProComm®).
2. Using the interface cable supplied by Coastal Environmental Systems, connect the computer's RS-232 serial port to the DE-9 (9-pin, 2-row connector) located at the top of the ZENO®-3200 faceplate and termed COM3 (refer to Figure 2-2).

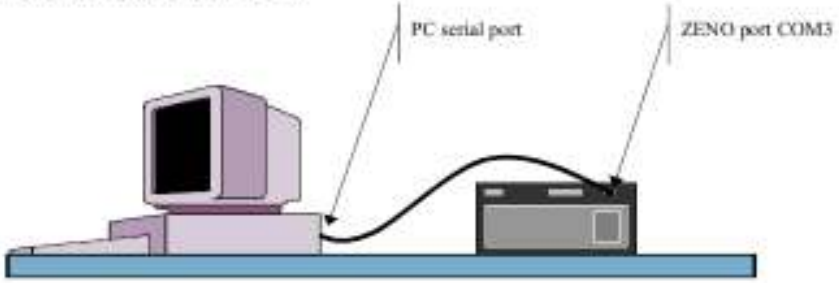

Figure 2-2. Connecting the ZENO®-3200 to your PC.

3. Start the terminal emulation program on your computer and set its communication settings to the ZENO®-3200's COM3 default settings as follows:

Computer's Serial Port Setting	Default ZENO®-3200 Value
Baud Rate	9600
Data Bits	8
Start Bits	1
Stop Bits	1
Parity	None
Flow Control	None

Anexo V

Free Wave, Radio Modem

Spread Spectrum
Wireless Data Transceiver
User Manual

Version 6.3

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Quick Start on a Point-to-Point Network

When purchased as a pair, the FreeWave® Wireless Data Transceivers are shipped from the factory pre-configured to operate in Point-to-Point applications. To establish communications between a pair of FreeWave Wireless Data Transceivers just received from the factory:

1. Connect the transceiver to the instrument with the RS232 cable and also attach power. The cable supplied with enclosed transceivers (except Waterproof) is a 9-pin male serial; professional board level transceivers will need a separate programming cable (sold separately).

2. Set the Modem mode in each transceiver. One should be set as a Point-to-Point Master (Mode 0) and the other set as a Point-to-Point Slave (Mode 1).

3. Set the baud rate on each transceiver to match the baud rate of the instrument to which it is attached. Please note, when setting the transceiver's baud rate, its RS232 data rate is set. The baud rate does not have to be on the same setting for the two transceivers.

4. Edit the Call Book. Enter the Slave serial number in the Master's Call Book. Enter the Master's Serial number in the Slave's Call Book, or disable Slave Security (in the Slave).

5. Connect antennas to the transceiver. Any FreeWave transceiver may be operated without an antenna for bench-top testing without concern for damaging the product. Noise potential may be reduced on the bench by lowering the Xmit power.

6. Shortly after both transceivers are plugged in, they should establish a communications link with each other and the connection is complete. Using the table below, verify that the radios are operating as expected.

Point-to-Point Operation LEDs

	Master			Slave			Repeater		
Condition	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)
Powered, no link	Solid red bright	Solid red bright	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red
Linked, no Repeater, sending sparse data	Solid green	Intermittent flash red	Intermittent flash red	Solid green	Intermittent flash red	Intermittent flash red	n/a	n/a	n/a
Master calling Slave through Repeater	Solid red bright	Solid red dim	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red
Master linked to Repeater, not to Slave	Flashing orange	Solid red dim	Solid red bright	Solid red bright	Off	Blinking red	Solid red bright	Solid red dim	Solid red bright
Repeater linked to Slave	Solid green	Intermittent flash red	Intermittent flash red	Solid green	Intermittent flash red	Intermittent flash red	Solid green	Intermittent flash red	Intermittent flash red
Mode 6 - waiting for ATD command	Solid red bright	Off	Blinking red	Solid red bright	Off	Blinking red	n/a	n/a	n/a
Setup Mode	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green	Solid green

Choosing a Location for the Transceivers

Placement of the FreeWave transceiver is likely to have a significant impact on its performance. The key to the overall robustness of the radio link is the height of the antenna. In general, FreeWave units with a higher antenna placement will have a better communication link. In practice, the transceiver should be placed away from computers, telephones, answering machines and other similar equipment. The 6-foot RS232 cable included with the transceiver usually provides ample distance for placement away from other equipment. To improve the data link, FreeWave Technologies offers directional and omni directional antennas with cable lengths ranging from 3 to 200 feet. When using an external antenna, placement of that antenna is critical to a solid data link. Other antennas in close proximity are a potential source of interference; use the Radio Statistics to help identify potential problems. The Show Radio Statistics page is found in option 4 in the Main Menu. An adjustment as little as 2 feet in antenna placement can resolve some noise problems. In extreme cases, such as when interference is due to a Pager or Cellular Telephone tower, the band pass filters that FreeWave offers, may reduce this out-of-band noise.

FreeWave also offers a waterproof version of the 900MHz transceivers. This model can be placed outdoors without additional weather protection. The waterproof enclosure requires an external antenna and includes a 6-foot data and power pigtail cable.

RS-422 and RS-485 Full Duplex Pin-Outs

Function	Bare Board Pin Number	DE-9 Pin Number
RX+	7	3
RX-	9	7
TX+	5	2
TX-	10	8
Signal Ground	4 or 6	5

RS-485 Half Duplex Pin-Outs

Function	Bare Board Pin Number	DE-9 Pin Number
Wire to both pins for Bus +	Short 5 and 7	Short 2 and 3
Wire to both pins for Bus -	Short 9 and 10	Short 7 and 8
Signal Ground	4 or 6	5

RS232 Pin Assignments

Pin		Assignment	Signal	Definition
1	CD	Carrier Detect	Output	Used to show an RF connection between transceivers.
2	TX	Transmit Data	Output	Used to transmit data bits serially from the transceivers to the system device.
3	RX	Receive Data	Input	Used to receive data bits serially from the system device connected to the transceivers.
4	DTR	Data Terminal Ready	Input	Used only in transceivers in Point-to-Point Slave/Master switchable mode or for DTR Connect.
5	GND	Ground		Signal return for all signal lines shared with Pin 9.
6	DSR	Data Set Ready	Output	Always high when the radio is powered from the 2.5mm power connector. Indicated power is on to the radio. Also, this pin can be used for +12Volts when powering the transceivers directly through the RS-232 port. **Note:** This is not used on the OEM module.
7	RTS	Request to Send	Input	The transceiver does not recognize RTS for flow control. RTS is used as a control line in RTS/CTS mode.
8	CTS	Clear to Send	Output	This signal is used to tell the system device connected to the transceiver that the transceiver is ready to receive data. When asserted, the transceiver will accept data, when deasserted the transceiver will not accept data. This should always be used for data rates above 38.4KB or there will be a risk of lost data if an RF link is not very robust.
9	GND	Ground		Signal return for all signal lines shared with Pin 5.

Technical Specifications

900 MHz Transceiver Specifications

Specification	
Frequency	902 to 928 MHz
Transmit	
Output Power	5 mW to 1 W (+30 dBm) See RF transmit power settings.
Range	60 miles Line Of Sight, 0 dB antenna gain
Modulation	Spread spectrum GFSK, 120 or 170 Kbps
Spreading method	Frequency hopping
Occupied bandwidth @ 60dB	230 kHz
Channel Spacing	230 kHz
Receive	
Sensitivity	-110 dBm at 10-4 bit error rate -108 dBm at 10-6 bit error rate
Selectivity	-20 dB at $f_c \pm 115$ kHz -60 dB at $f_c \pm 145$ kHz
System gain	140 dB
Data transmission	
Data rate	115.2 kbps sustained throughput* 57.6 kbps sustained throughput* with Repeaters
Error detection	32 Bit CRC, retransmit on error
Data encryption	Substitution, dynamic key
Max link throughput	115.2 KBaud
Data interface	RS-232/RS485 1200 Baud to 230.4 KBaud, async, full duplex TTL (RF board level only) Ethernet 10BaseT
Power requirements	
Supply voltage	6 to 30 VDC
Transmit current, for 1 W power at 100% duty cycle	6 VDC: 1 A 12 VDC: 500 mA 30 VDC: 200 mA
Receive current	6 VDC: 140 mA 12 VDC: 75 mA 30 VDC: 55 mA
Idle current	6 VDC: 37 mA 12 VDC: 21 mA 30 VDC: 16 mA
Sleep current	6 VDC: 12 mA 12 VDC: 6 mA 30 VDC: 5 mA
Operating modes	Point-to-Point Point to-MultiPoint
Operating environment	-40° C- +75° C, 0 to 95% humidity non-condensing

* At 100% receive success rate. RF data rate setting of 2.

OEM Full Size Board Level Mechanical Drawing