

13

data from the at least one other sensor module with position data, and transmitting packaged digital sensor data and position data to the remote data system through the satellite communication modem and internal antenna;

wherein in a second mode, where the at least one sensor module is configured as a smart end device, receiving analog sensor data from at the least one sensor, converting the analog sensor data to digital sensor data in the analog-to-digital converter, and transmitting the digital sensor data to another sensor module configured as a smart module coordinator; and

wherein in a third mode, the sensor module is configured as a stand-alone smart sensor device, receiving analog sensor data from the at least one sensor, converting the analog sensor data to digital sensor data in the analog-to-digital converter, packaging digital sensor data from the at least one other sensor module with position data, and transmitting packaged digital sensor data and position data to the remote data system through the satellite communication modem and internal antenna.

2. The sensor module of claim 1, further comprising:

a global positioning system receiver, coupled to the processor and an internal antenna, generating position data to the processor, the processor further configured to include package position data with digital sensor data for transmission to the remote data system;

wherein the satellite communication modem, coupled to the processor and the internal antenna, receives packaged digital sensor data and position data and transmits the packaged digital sensor data and position data to the remote data system.

3. A sensor module for accumulating, processing and transmitting sensor data, comprising:

a data input for receiving sensor data from at least one instrument, and formatting the sensor data as digital sensor data,

a processor, coupled to the data input, configured to process and store the digital sensor data in memory, and packaging digital sensor data for transmission to a remote data system; and

a satellite communication modem, coupled to the processor and the internal antenna, receiving packaged digital sensor data and transmitting the packaged digital sensor data to the remote data system,

wherein the data input further including one or more of:

a first analog input configured to receive analog sensor data from at least one external sensor, a signal conditioning circuit receiving the analog sensor data and conditioning the analog sensor data, and an analog-to-digital converter, coupled to the signal conditioning circuit, configured to convert conditioned analog sensor data into digital sensor data, and

a first digital input configured to receive one or more of digital sensor data from an external sensor and user control data from a user, wherein the processor, coupled to the analog-to-digital converter and the first digital input, is configured to process and store the digital sensor data in memory, and packaging digital sensor data for transmission to a remote data system,

the sensor module further comprising a local wireless communications system, coupled to the processor and configured to communication bi-directionally with a plurality of other sensor modules, to receive digital sensor data from other sensor modules and to transmit commands to other sensor modules,

14

wherein a sensor module may be configured through one or more of user control data from the first digital input and memory of the processor, to configure a sensor module in at least one of a plurality of modes,

wherein in a first mode the sensor module is configured as a smart module coordinator, receiving digital sensor data from at least one other sensor module, storing digital sensor data from the at least one other sensor module, packaging digital sensor data from the at least one other sensor module with position data, and transmitting packaged digital sensor data and position data to the remote data system through the satellite communication modem and internal antenna,

wherein in a second mode, the sensor module is configured as a smart end device, receiving analog sensor data from at the least one sensor, converting the analog sensor data to digital sensor data in the analog-to-digital converter, and transmitting, through the local wireless communications system, the digital sensor data to another sensor module configured as a smart module coordinator; and

wherein in a third mode, the sensor module is configured as a stand-alone smart sensor device, receiving analog sensor data from the at least one sensor, converting the analog sensor data to digital sensor data in the analog-to-digital converter, packaging digital sensor data from the at least one other sensor module with position data, and transmitting packaged digital sensor data and position data to the remote data system through the satellite communication modem and internal antenna.

4. A sensor module for accumulating, processing and transmitting sensor data, comprising:

a data input for receiving sensor data from at least one instrument, and formatting the sensor data as digital sensor data,

a processor, coupled to the data input, configured to process and store the digital sensor data in memory, and packaging digital sensor data for transmission to a remote data system; and

a satellite communication modem, coupled to the processor and the internal antenna, receiving packaged digital sensor data and transmitting the packaged digital sensor data to the remote data system,

wherein the data input further including one or more of:

a first analog input configured to receive analog sensor data from at least one external sensor, a signal conditioning circuit receiving the analog sensor data and conditioning the analog sensor data, and an analog-to-digital converter, coupled to the signal conditioning circuit, configured to convert conditioned analog sensor data into digital sensor data, and

a first digital input configured to receive one or more of digital sensor data from an external sensor and user control data from a user, wherein the processor, coupled to the analog-to-digital converter and the first digital input, is configured to process and store the digital sensor data in memory, and packaging digital sensor data for transmission to a remote data system,

the sensor module further comprising a global positioning system receiver, coupled to the processor and an internal antenna, generating position data to the processor, the processor further configured to include package position data with digital sensor data for transmission to the remote data system;

a local wireless communications system, coupled to the processor and configured to communication bi-directionally with a plurality of other sensor modules, to