RS100 SENSOR (RTS1) – RAIN/TEMPERATURE

BLOCK DIAGRAM DESCRIPTION 24SEP2009

The micro-controller (A) supplies all timing, control and conversion functions within the Rain Temperature Sensor. The micro-controller processes the analog input from the thermistor (D), the digital input from the tipping bucket switch (E) and the analog data from the battery voltage level (G) and prepares the data stream to be transmitted by the transmitter (B). The transmission of temperature and battery condition occurs every 15 minutes if there is no tipping bucket switch input. If there is a tipping bucket switch (E) activation and release the temperature, battery condition and the tip information is sent within 1 to 2 seconds of the tipping bucket input. When a transmission is to occur the micro_controller provides power to the transmitter through the transistor switch (C), waits a short length of time (about 200ms) and then outputs the DATA to the transmitter. A complete data string is transmitted 6 times with a small interval between transmissions. The transmitter is active a total of about 900ms every 15 minutes or with each tipping bucket switch activation.

The thermistor (D) is a temperature dependent variable resistor. It has a negative temperature coefficient and provides an analog input to the micro-controller. The micro-controller processes the analog signal and produces two 8 bit bytes of digital data representing the measured temperature. Byte seven is the integer temperature in hexadecimal and byte eight is reserved in the transmitted data stream.

The tipping bucket switch (E) is activated and released when the tipping bucket tips from one side to the other side. The tipping bucket provides a digital input to the micro-controller and represents a specific amount of rain fall. When the data stream is prepared for transmission, the micro-controller processes this digital information as a single set bit for a tip and a single cleared bit for no tip. The bit is appended to the sixth byte, bit 7 of the transmitted data stream.

Two 1.5 volt (nominal) AA alkaline batteries (F) connected in series are used to power the sensor unit. The total battery voltage will range from 3.2 volts (fully charged) when first installed to between 2.7 and 2.6 volts when the low battery flag is set. The battery voltage is distributed from the micro-controller to the sensing elements (D) and (E) and through a transistor (C) to power the transmitter.

Transmitter (B) when supplied power through transistor (C) converts the digital DATA from the micro-controller to a transmitted stream containing the sensor information. The sensor information format is outlined below.

TRANSMITTED DATA FORMAT 24SEP2009

The sensor transmitted data format is based upon the Smart Controller (sensor) description of 07Oct2008.

A 1 is represented by a single cycle of a 1ms square wave and a 0 is represented by a single cycle of a 500us square wave. The data stream, with the exception of the transmission start, is designed to be a symmetrical 50% duty cycle.

The transmission starts with the data line high for 7ms and then low for 4ms. The data stream of bytes immediately follows this condition.

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The first and second bytes are the start condition and represented by 0xA5A5.

The third and fourth bytes are the transmitter's address and represented by 0x000F (15 minute transmission interval).

The fifth byte represents the length of data contained in the transmission and will always be set to 0x06.

The sixth byte represents the rain tip and the battery status. 0x02 will represent no rain tip and a good battery. 0x82 will represent a rain tip and a good battery. 0x01 will represent no rain tip and a low battery. 0x81 will represent a rain tip and a low battery.

The seventh byte represents the integer value of the temperature and is hexadecimal format.

The eight byte represents a reserved byte and is not used by the controller at this time.

The ninth byte is reserved, not used by the controller and set to 0x00.

The tenth and eleventh bytes are reserved, not used by the controller and set to 0x0000.

The twelfth byte is a checksum and is the result of logically XORing the sixth byte to the eleventh byte.

Data is sent from the MSB to the LSB.

The complete data stream, including the transmission start, is transmitted 6 times for a total transmission length of 900ms for each event. An event being temperature transmission every 15 minutes or a tipping bucket switch activation.

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