

# APPLICATION NOTE

## *Vaisala DRS511 Road Sensor*



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WHEN MEASUREMENTS MATTER

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# Vaisala DRS511 Road Sensor

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*This application note describes using the Vaisala DRS511 Road Sensor with Campbell Scientific dataloggers. Specifically the document includes installation information and programming.*

## General Information

The DRS511 is an in pavement road sensor that measures

- Water depth, and snow and ice detection
- Surface conductivity
- Amount of existing deicing chemical on the road surface
- Black ice detection
- Surface temperature
- Ground temperature

The sensor itself is an analog device. After measurements are made, calculations need to be applied to the measurements to provide meaningful outputs. For this reason this sensor is used with the Vaisala Rosa system consisting of the card cage with the DM31, and DRI 50 cards installed. This configuration uses calculations set up by Vaisala to provide the proper outputs.

Also necessary for operation are two additional Vaisala sensors that provide inputs for the calculated outputs. They are the DRD11A and HMP45D. The DRD11A is a rain yes/no sensor, and the HMP45D measures temperature and relative humidity.

## Hardware

### Setup

Communication with the logger is with the RS-232 interface.

There is no configuration needed for the ROSA system. All configuration is done in the program

### Installation

The DRS511 sensor is installed in the road surface.

The DRD11A mounts to our UT-018 or UT018-5 crossarm. It connects to the ROSA card cage according to the manual.

The HMP45D mounts in the current radiation shield for the HMP45C-L. The HMP45D connects to the ROSA card cage according to the manual.

Serial communication is connected to the DRI 50, and can be routed to either the 9 pin RS232 port or the comports on the CR1000.

The ROSA system uses 115 vac, so any station using the DRS511 will be recharged by ac.

# Programming

The drs511 is a resistive device that is measured by the vaisal rosa system. For this set up, a rosa box with the dm31, and dr150 50 cards are used. Sensors are connected to the DRI50 according to the manual. The second port for the road sensor was used for this program.

Connection to the DRI50 to the logger was done with an sc110 with pins on the db9 side.

The sc110 connections are

sc110 - dri50

yl - gnd

wh - txd

bn - rxd

This program uses the rs232 port on the logger.

The dri50 also needs the drd11a, and hmpp45d sensor, and as discussed above they are connected according to the manual.

There is no set up required for the rosa system. Factory defaults are used.

The operation of the program polling the sensor, getting the data, and parsing the data with split strings for each data value. Data filters are set up to tell the split string where to look in the raw data for the data point.

polling string, and returned data string.

```
Public drspoll As String,drsraw As String * 400,returnedc  
variable declarations for data points and filters
```

```
Public airtemp,airtempfilter As String '1  
Public humidity,humidityfilter As String '2  
Public dewpnt,dewpntfilter As String '3  
Public rainonoff,rainonofffilter As String '4  
Public genstatus,genstatusfilter As String '16  
Public surftemp,surftempfilter As String '45  
Public groundtemp,groundtempfilter As String '46  
Public conductivity,conductivityfilter As String '47  
Public surfacesig,surfacesigfilter As String '48  
Public bkicefrequency,bkicefrequencyfilter As String '49  
Public freezpoint,freezpointfilter As String '50  
Public surfstatus,surfstatusfilter As String '51  
Public concentration,concentrationfilter As String '54  
Public chemamt,chemamtfilter As String '55  
Public freeztemp,freeztempfilter As String '56  
Public filmthick,filmthickfilter As String '57
```

```
DataTable (Table,True,-1)
```

```
DataInterval (0,10,Sec,10)  
Sample (1,drsraw,String)  
Sample (1,airtemp,FP2)  
Sample (1,humidity,FP2)  
Sample (1,dewpnt,FP2)
```

```

Sample (1,rainonoff,FP2)
Sample (1,genstatus,FP2)
Sample (1,surftemp,FP2)
Sample (1,groundtemp,FP2)
Sample (1,conductivity,FP2)
Sample (1,surfacesig,FP2)
Sample (1,bkicefrequency,FP2)
Sample (1,freezpoint,FP2)
Sample (1,surfstatus,FP2)
Sample (1,concentration,FP2)
Sample (1,freeztemp,FP2)
Sample (1,filmthick,FP2)

```

```
EndTable
```

```
'Main Program
```

```
BeginProg
```

```
'Polling string
```

```
drspoll=CHR(13)+CHR(64)+CHR(49)+CHR(32)+CHR(77)+CHR(32)+CHR(49)+
CHR(52)+CHR(13)
```

```
'Data filter definitions
```

```

airtempfilter=CHR(48)+CHR(49)+CHR(32)
humidityfilter=CHR(59)+CHR(48)+CHR(50)
dewpntfilter=CHR(59)+CHR(48)+CHR(53)
rainonofffilter=CHR(59)+CHR(48)+CHR(52)
genstatusfilter=CHR(59)+CHR(49)+CHR(54)
surftempfilter=CHR(59)+CHR(52)+CHR(53)
groundtempfilter=CHR(59)+CHR(52)+CHR(54)
conductivityfilter=CHR(59)+CHR(52)+CHR(55)
surfacesigfilter=CHR(59)+CHR(52)+CHR(56)
bkicefrequencyfilter=CHR(59)+CHR(52)+CHR(57)
freezpointfilter=CHR(59)+CHR(53)+CHR(48)
surfstatusfilter=CHR(59)+CHR(53)+CHR(49)
concentrationfilter=CHR(59)+CHR(53)+CHR(52)
chemamfilter=CHR(59)+CHR(53)+CHR(53)
freeztempfilter=CHR(59)+CHR(53)+CHR(54)
filmthickfilter=CHR(59)+CHR(53)+CHR(55)

```

```
Scan (10,Sec,0,0)
```

```
SerialOpen (COMRS232,9600,0,0,400)
```

```
'Polling string send
```

```
SerialOut (COMRS232,drspoll,"",0,90)
```

```
'Raw data is returned
```

```
SerialInBlock (COMRS232,drsraw,380)
```

```
'Data parsing code
```

```
SplitStr (airtemp,drsraw,airtempfilter,1,4)
```

```
SplitStr (humidity,drsraw,humidityfilter,1,4)
```

```
SplitStr (dewpnt,drsraw,dewpntfilter,1,4)
```

```
SplitStr (rainonoff,rainonofffilter,rainonofffilter,1,4)
SplitStr (genstatus,drsraw,genstatusfilter,1,4)
SplitStr (surftemp,drsraw,surftempfilter,1,4)
SplitStr (groundtemp,drsraw,groundtempfilter,1,4)
SplitStr (conductivity,drsraw,conductivityfilter,1,4)
SplitStr (surfacesig,drsraw,surfacesigfilter,1,4)
SplitStr (bkicefrequency,drsraw,bkicefrequencyfilter,1,4)
SplitStr (freezpoint,drsraw,freezpointfilter,1,4)
SplitStr (surfstatus,drsraw,surfstatusfilter,1,4)
SplitStr (concentration,drsraw,concentrationfilter,1,4)
SplitStr (chemamt,drsraw,chemamtfilter,1,4)
SplitStr (freeztemp,drsraw,freeztempfilter,1,4)
SplitStr (filmthick,drsraw,filmthickfilter,1,4)

'SerialInRecord (COMRS232,drsraw,0,380,&H3D,returnedc,01)
CallTable Table
```

```
NextScan
EndProg
```