*Ventilation*

Data Management Plan

*8/31/2017*

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# Context

## Title

Purpose: To monitor CCHRC interior conditions with regards to temperature, CO2 concentration, and humidity.

Funders: CCHRC

Duration: 2008- ongoing

Folder Locations: \\cabin\CCHRC\Building Science Research\Projects\RTF Data Management\2017 Data uploads\ongoing RTF Ventilation

Proposal Documents: N/A

## Data Collection

In order to meet the objectives digital data will be collected, stored, and analyzed. …

### Data Stream 1

Data is collected by a CR1000 dataloggerin 15 minute, hourly and daily tables. The datalogger is connected to the CCHRC network via a wireless antenna.

## Policies

The CR1000 scans the data every 5 sec and records data every 15 minutes, hourly and daily. The data will be stored on the logger and sent to the UAF data collection site once a day.

## Responsibilities

The CCHRC data manager is responsible for maintaining the data.

# Organization of data

#### File structure

Data is recorded on the CR1000 as a time series. Each recording interval becomes a data table. Tables will be programed to output very specific data for future analysis. Raw tables will be stored as .csv files.

The CR1000 has the capability of creating calculated data points. These calculated data points will be stored in separate table files.

#### Naming conventions

Each data point will have a specific name. Data names will be as descriptive as possible and end with “\_units”The CR1000 outputs tables based on data time intervals. The data tables will be organized in the best way possible to create meaningful data later, the start of the data table name is RTFSOLAR and end with the time interval.

#### Formats and Units

*All numbers will be no longer than 4 values after the decimal place. The data will be stored as a .csv.*

#### Data analysis formats

.csv will be converted into other formats for analysis. Excel and Matlab are two potential formats for analyzed data.

#### Versioning

Raw data files will be saved in the data file within the project file. Any analyzed data will have the date of the analyzed data in its name. Data should not be overwritten if new analysis takes place, a new version of the data should be saved with a new name that includes the date.

## Digital Data

*Each location will have 4 data files produced by the CR1000s (a backup file, a 1 min, a 5 min and a 1 hour file). Detailed information about each collection system is in the data standards appended to this document.*

# Documentation and Metadata

## Data Documentation

All digital data and documentation for this project will be stored here http://www.cchrc.org/research-data-system

## Metadata

Data on the sensors in this projectwill follow a very specific format. There is an overall data standards document outlined below.

#### Data Standards

Detailed data standards are appended to this document. The data standards include details about each sensor, its purpose, and location. The CR1000 programs and wiring diagrams are appended to the data standards. Data standards and wiring diagrams will be kept in here http://cchrc.org/research-data-systemand updated on a semi-yearly basis.

#### Metadata Spreadsheet

Each data file will have a metadata spreadsheet. *The template can be found here, http://cchrc.arsc.edu/DataFileVariables.xls*

# Storage and Security

Sensor data will be stored on the ARSC server for CCHRC and accessible here, http://www.cchrc.org/research-data-system

# Preservation and Sharing

The data will remain on the ARSC site for CCHRC data and be accessible to future researchers.

# Appendix

## Sample - Data Measurement and Recording Standards

Last Update: Dec. 2, 2014

Last Update By: Robbin

Sensor: US Sensor PS103J2 NTC Thermistors

Measurement Range: -80°C to 150°C ±0.1°C

Output Units: temp in ° C

Scan Interval:1 second

Averaging Interval: 1 minute, 5 minute and hourly

Algorithms: using the CR1000 programming

Const b = 0.00023131427

Const c = 0.000000109342

For i=1 To 26

 Therm\_kOhm(i) = (10\*therm(i))/(1-therm(i)) [with 10 kohm resistor in bridge)

 Next i

 For i=1 To 26

 D(i) = LN (1000\*Therm\_kOhm(i)) 'ln resistance (ohm)

 Next i

 For i=1 To 26

 Temp\_C(i) = (1/(a + b\*D(i) + c\*(D(i))^3)) - 273.15 'Steinhart & Hart Equation Next i

Sensor: Honeywell HIH4000-001 RH sensors

Measurement Range: 0 to 100% ±3.5%

Output Units: %RH

Scan Interval: 1 second

Averaging Interval: 1 minute, 5 minute and hourly

Algorithms: using the CR1000 programming

VoltSe (MTLSI\_raw,1,mV5000,2,1,0,250,1.0,0)

'Convert Raw voltage to RH

MTLSI\_RH=(MTLSI\_raw-.8)/0.031

Sensor: Setra Pressure transducer 265

Measurement Range: 0 to 249 Pa ±1%

Output Units: differential pressure Pascals across the exhaust stream.

Scan Interval: 1 second

Averaging Interval: 1 minute, 5 minute and hourly

Algorithms: using the CR1000 programming

VoltSe (MTLpressure\_raw,1,mV5000,6,1,0,250,1,0)

MTLpressure\_PA=49.82\*MTLpressure\_raw

Wiring Diagram



Figure 3. This diagram is labeled MTL but all the loggers will have the same wiring.

## Programs - Sample

'Program Name MTL ERV

'date 2.5.2115

Public LoggerTemp\_C,

Public Therm\_kOhm(14), Temp\_C(14), therm(14)

Public MTLSI\_C, MTLEO\_C, MTLSO\_C, MTLEI\_C, MTLroom\_C

Public MTLSI\_RH, MTLEO\_RH, MTLSO\_RH, MTLEI\_RH, MTLroom\_RH

Public MTLSI\_raw, MTLEO\_raw, MTLSO\_raw, MTLEI\_raw, MTLroom\_raw

Public MTLpressure\_raw, MTLpressure\_PA

Dim i

Dim D(26)

' For thermistors -- conversion of kOHM to deg C

Const a = 0.0011428819

Const b = 0.00023131427

Const c = 0.000000109342

Alias Temp\_C (1)=MTLSI\_C1

Alias Temp\_C (2)=MTLSI\_C2

Alias Temp\_C (3)=MTLSI\_C3

Alias Temp\_C (4)=MTLEO\_C1

Alias Temp\_C (5)=MTLEO\_C2

Alias Temp\_C (6)=MTLEO\_C3

Alias Temp\_C (7)=MTLSO\_C1

Alias Temp\_C (8)=MTLSO\_C2

Alias Temp\_C (9)=MTLSO\_C3

Alias Temp\_C (10)=MTLEI\_C1

Alias Temp\_C (11)=MTLEI\_C2

Alias Temp\_C (12)=MTLEI\_C3

Alias Temp\_C (13)=MTLroom\_C1

Alias Temp\_C (14)=MTLroom\_C2

'\\\\\\\\\\\\\\\\\\\\\\\\ OUTPUT SECTION ////////////////////////

DataTable(MTL\_minbackup, true, -1)

 DataInterval(0,60,sec,10)

 Average (1, MTLSI\_C1, FP2, false)

 Average (1, MTLSI\_C2, FP2, false)

 Average (1, MTLSI\_C3, FP2, false)

 Average (1, MTLEO\_C1, FP2, false)

 Average (1, MTLEO\_C2, FP2, false)

 Average (1, MTLEO\_C3, FP2, false)

EndTable

'\\\\\\\\\\\\\\\\\\\\\\\\\\\ PROGRAM ////////////////////////////

BeginProg

 Scan(5,Sec,1, 0)

 PanelTemp(LoggerTemp\_C, 250)

'Measure RH sensors, convert mV to V with .001 multiplier

VoltSe (MTLSI\_raw,1,mV5000,4,1,0,250,.001,0)

VoltSe (MTLEO\_raw,1,mV5000,5,1,0,250,.001,0)

VoltSe (MTLSO\_raw,1,mV5000,6,1,0,250,.001,0)

VoltSe (MTLEI\_raw,1,mV5000,7,1,0,250,.001,0)

VoltSe (MTLroom\_raw,1,mV5000,8,1,0,250,.001,0)

'Convert Raw voltage to RH

MTLSI\_RH=(MTLSI\_raw-.8)/0.031

MTLEO\_RH=(MTLEO\_raw-.8)/0.031

MTLSO\_RH=(MTLSO\_raw-.8)/0.031

MTLEI\_RH=(MTLEI\_raw-.8)/0.031

MTLroom\_RH=(MTLroom\_raw-.8)/0.031

'measure pressure, convert mV to V with .001 multiplier, convert raw to PA

VoltSe (MTLpressure\_raw,1,mV5000,9,1,0,250,.001,0)

MTLpressure\_PA=49.82\*MTLpressure\_raw

'MEASURE THERMISTORS

PortSet (1,1) ' Turn on mux

i=1

SubScan (0,Sec,7)

 Delay (0,10,mSec)

PulsePort(4,10000) ' Clock mux

 BrHalf(therm(i),2,Autorange,1,Vx1,2,2500,True,0,\_60Hz, 1.0, 0)

i=i+2

NextSubScan

PortSet (1,0) ' turn mux off.

 For i=1 To 26

 Therm\_kOhm(i) = (10\*therm(i))/(1-therm(i))

 Next i

 For i=1 To 26

 D(i) = LN (1000\*Therm\_kOhm(i)) 'ln resistance (ohm)

 Next i

 For i=1 To 26

 Temp\_C(i) = (1/(a + b\*D(i) + c\*(D(i))^3)) - 273.15 'Steinhart & Hart Equation for new thermistors

 Next i

'Average duplicate temperature points

MTLSI\_C= (Temp\_C(1)+Temp\_C(2)+Temp\_C(3))/6

MTLEO\_C=(Temp\_C(4)+Temp\_C(5)+Temp\_C(6))/6

MTLSO\_C=(Temp\_C(7)+Temp\_C(8)+Temp\_C(9))/6

MTLEI\_C=(+Temp\_C(10)+Temp\_C(11)+Temp\_C(12))/6

MTLroom\_C=(Temp\_C(13)+Temp\_C(14))/2

'OUTPUT

 CallTable (MTL\_minbackup)

NextScan

EndProg