# Weller GSHP

# Data Measurement and Recording Standards

Last Update: 5/9/2011

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# In-ground Temperature Sensors

Main Question Intended: How does the ground temperature change within the heat pump ground loop?

Sensor: Maxim DS 18B20+PAR

Location: 3 strings of nine sensors in the pit to 22 feet depth, one string of 22 feet depth to side of pit, Depths: 1, 4,6,8,10,12,14, 18, 22 ft from grade

Measurement Range: -55°C to 100°C

Output Units: temp in ° C

Scan Interval: Hourly

Folder Location: \\Yaranga\cchrc\Building Science Research\Projects\Weller Heat Pump\Ground Program and Sensors

**In-building sensors**

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**Duct Flow Meter**

* Sensors
	+ Flowmeter – Air\_Flow in CFM
	+ Before heat pump – thermistor in duct before heat pump – Duct\_Temp in °C
	+ After heat pump – Air\_exit\_temp in °F

Main Question Intended: How much heat energy does the heat pump supply?

Sensor – Ebtron model STx104-PB

Location: in the duct leaving the heat pump

Measurement Range: -20 to 160 °F

Output Units: amps

Algorithm:

airflow=2.243\*(x\*8.474-4)/16\*5000

airtemp=(x\*8.474-4)/16\*(160+20)-20

thermistor

 R = 10\*10\*\*3

 X = 2\*10\*\*9

 a=0.0011253

 b=.000234

 c=.0000000856

 y=R\*X/(R+X)

 y=y\*((5/x)-1)

 thermistor temp=(1/(a+b\*d+c\*d\*\*3))-273.15

Scan Interval:

**Heat Pump Loop BTU meter**

* Temperature sensors
	+ Before ground loop/after buffer tank – thermistor - GL\_return\_temp x2 °C
	+ Before heat pump – GL\_supply\_temp °F
	+ After heat pump – HP\_exit\_temp °F
* Flow Rate – GL flow rate - GPM
* Energy Output – GL HP BTU rate BTU/hr

Main Question Intended: How much heat energy does the ground loop supply?

Sensor : Onicon F1100

Location: after pump 1 before ground loop

Measurement Range: 20 °F to 205 °F

Output Units: amps

Algorithms:

Temp=(x\*31.78)-5

 Flow=(x\*15.89)-7.5

Thermistor

 R = 10\*10\*\*3

 X = 2\*10\*\*9

 a=0.0011253

 b=.000234

 c=.0000000856

 y=R\*X/(R+X)

 y=y\*((5/x)-1)

 thermistor temp=(1/(a+b\*d+c\*d\*\*3))-273.15

Scan Interval:

**Solar Loop BTU meter**

* Temperature sensors
	+ Before solar panel – SL\_supply\_temp °F
	+ After solar panel – SL\_exit\_temp °F
* Flow Rate – SL flow rate – GPM
* Energy Output – SL BTU rate BTU/hr

Main Question Intended: How much energy does the solar loop provide?

Sensor : Onicon F1100

Location: after pump 2 before solar panels

Measurement Range: 20 °F to 205 °F

Output Units: amps

Algorithm:

returnTemp=(x\*90.04)-12.5

 supply Temp=(x\*37.07)+12.5

 Flow=(x\*15.89)-7.5

Scan Interval:

**Pump 1 Electrical Meter**

Main Question Intended: How much energy does the pump use?

Sensor CR8410-1000G x3 (3 phase power)

Location: on electrical supply

Measurement Range: 7 amp max

Output Units: amps

Algorithm: amp=((x/20)/5.9)\*1007

Scan Interval:

**Pump 2 Electrical Meter**

Main Question Intended: How much energy does the pump use?

Sensor CR8401-1000-G

Location: on electrical supply

Measurement Range: max 4 amp

Output Units: amps

Algorithm: amp=((x/20)/5.9)\*1005

Scan Interval:

**Heat Pump Electrical Meter**

Main Question Intended: How much energy does the pump use?

Sensor CR 8420-1000 x3 (3-phase power)

Location: on electrical supply

Measurement Range: max 50 amps

Output Units: amps

Algorithm: amp=((x/20)/5.9)\*1018

Scan Interval: