INSTRUCTION MANUAL

App. Note Code: 2WI-O

IceFree3A and IceFree3V Interfaced with Campbell Scientific® Dataloggers

4/15

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IceFree3A and IceFree3V Interfaced with Campbell Scientific Dataloggers

This application note describes interfacing a CR800, CR850, CR1000, CR3000, and CR6 datalogger to IceFree™ sensors; wiring and programming information are provided. The IceFree3 anemometer and vane are electrically-heated wind sensors for ice-prone sites. They are manufactured by NRG. Campbell Scientific uses the model number IceFree3A for the anemometer, and IceFree3V for the vane.

1. Wiring

1.1 IceFree3A Anemometer Wiring

The grey cable connects the anemometer to the datalogger (TABLE 1-1), and the red cable connects the anemometer's heater to a 24 V power supply (TABLE 1-2).

TABLE 1-1. IceFree3A Connections to Campbell Scientific Datalogger Channels (grey cable)

Wire Color	Description	CR800 CR850 CR1000 CR3000	CR6
Clear	Signal	Pulse	Even numbered universal channel (U)
Black	Signal Reference	⏚	⏚
Shield	Shield	⏚	⏚

TABLE 1-2. IceFree3A Heater Connections to 24 V Power Supply (red cable)

Color	Description	24 V Heater
Black	Voltage	24 V
White	Ground	G

1.2 IceFree3V Vane Wiring

The grey cable connects the vane to the datalogger (TABLE 1-3), and the red cable connects the vane's heater to a 24 V power supply (TABLE 1-4).

TABLE 1-3. IceFree3V Connections to Campbell Scientific Dataloggers Pulse Channels (grey cable)

Wire Color	Description	CR800 CR850 CR1000 CR3000	CR6
Red	Excitation +	EX or VX	U
Black	Reference	⏚	⏚
White	Signal	Single-ended (SE) channel	U configured as an SE channel
Shield	Shield	⏚	⏚

TABLE 1-4. IceFree3V Heater Connections to 24 V Power Supply (red cable)

Color	Description	24 V Heater
Black	Voltage	24 V
White	Ground	G

2. Datalogger Programming

2.1 IceFree3A Wind Speed

Wind speed is measured with the **PulseCount()** instruction, using the low-level AC configuration and set to output frequency in hertz. The **PulseCount()** has the following form:

PulseCount(*Dest, Reps, PChan, PConfig, POption, Mult, Offset*)

Where,

- *PConfig*: Enter 1 for Low level AC (pulse channels only)
- *POption*: Enter 1 for output in hertz

The following expression for wind speed (U) is used to determine the multiplier and offset:

$$U = MX + B$$

where

M = multiplier

X = number of pulses per second (hertz)

B = offset

TABLE 2-1 lists the multipliers (M) and offsets (Off) to obtain meters/second when the **PulseCount()** instruction is configured to output the result in hertz.

TABLE 2-1. Wind Speed Multiplier for m/s*	
Multiplier	0.572
Offset	1
*When configured to output counts, the multiplier above is divided by the execution interval in seconds.	

2.2 IceFree3V Wind Direction

Use the **BRHalf()** instruction to measure wind direction. For the CR800, CR850, CR1000, and CR3000, the **BRHalf()** instruction has the following form:

BrHalf(*Dest, Reps, Range, SEChan, ExChan, MeasPEx, ExmV, RevEx, SettlingTime, Integ, Mult, Offset*)

For the CR6, the **BrHalf()** instruction has the following form:

BrHalf(*Dest, Reps, Range, SEChan, ExChan, MeasPEx, ExmV, RevEx, SettlingTime,* f_{N1}*, Mult, Offset*)

Excitation voltages, range codes, and multipliers for our dataloggers are listed in TABLE 2-2. The multiplier value converts the sensor's millivolt output to degrees.

TABLE 2-2. Parameters for Wind Direction			
	CR800 CR850 CR1000	**CR3000**	**CR6**
Measurement Range	2500 mV	5000 mV	5000 mV
Integration or f_{N1}	60 Hz, reverse excitation	60 Hz, reverse excitation	60 Hz
Excitation Voltage	2500 mV	2500 mV	2500 mV
Multiplier	360	360	360
Offset	0	0	0

2.3 Example Program

The following is a CR1000 program that measures the IceFree3A and IceFree3V.

```
'CR1000

'Declare Variables and Units
Public Batt_Volt
Public Wind_Speed
Public Wind_Dir

Units Batt_Volt=Volts
Units Wind_Speed =meters/second

'Define Data Tables
DataTable(Table1,True,-1)
  DataInterval(0,10,Min,10)
  Average(1,Wind_Speed,FP2,False)
  WindVector(1,Wind_Speed,Wind_Dir,FP2,False,0,0,4)
  FieldNames("Wind_Dir_D1_WVT,Wind_Dir_SD1,WVT")
EndTable

'Main Program
BeginProg
  Scan(5,Sec,1,0)
    'Default Datalogger Battery Voltage measurement Batt_Volt:
    Battery(Batt_Volt)

    ‘Measure Wind Speed with IceFree3 Anemometer in m/s:
    PulseCount(Wind_Speed,1,1,1,1,0.572,1)
    If Wind_Speed <= 1 Then Wind_Speed = 0

    'IceFreeV Wind Direction Sensor measurement Wind_Dir
    BrHalf(Wind_Dir,1,mV2500,1,Vx1,1,2500,True,0,_60Hz,360,0)

    'Call Data Tables and Store Data
    CallTable(Table1)
  NextScan
EndProg
```

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