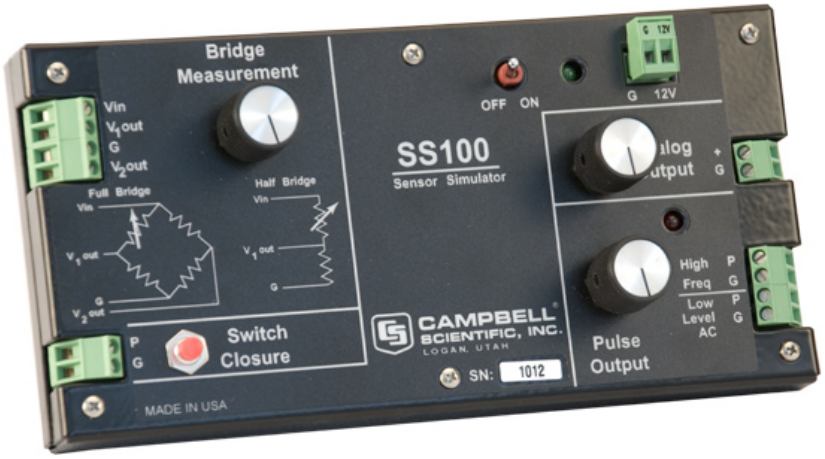
INSTRUCTION MANUAL

SS100 Sensor Simulator

12/10



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815 West 1800 North
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SS100 Table of Contents

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SS100 Sensor Simulator

1. General

The SS100 is a device used when the Campbell Scientific CR1000/LoggerNet Training Course is taught out-of-house. The SS100 is powered by a nominal 12VDC power source, typically the datalogger itself, and provides several outputs typical of those from sensors commonly measured by Campbell Scientific dataloggers.

The Training Course instructors may use the SS100 in a variety of simulations of their own choosing or use the analogies in this manual.

2. Specifications

Supply Voltage
- 12VDC

Analog Outputs
- 0-2.2 VDC

Pulse Outputs
- High Frequency Pulse: 0-5 VDC, 3-140 Hz, non-linear
- Low Level AC: 1 VDC, 3-140 Hz, non-linear

Bridge Measurement
- Full bridge circuit
- Fixed resistors 5 Kohm
- Variable resistor 10 Kohm

Switch Closure
- Momentary push button switch, normally open
- Approximate duration: 135 ms

3. Wind Speed and Direction Simulation

Sensor: Wind Speed and Direction

Wind Direction (Use SS100 Analog Output)
- Range: 0-360°
- Accuracy: +/- 3%
- Resolution: 1°
- Wind Direction Voltage: 0-2200 mVDC

Wiring

SS100	CR1000
+	SE1
G	⏚

Multiplier and offset calculation:
- Multiplier = 360 degrees / 2200 mV
- Offset = 0

CRBasic Measurement Instruction:
VoltSe (WindDir,1,mv2500C,1,1,0,_60Hz,360/2200,0)

Wind Speed (Use SS100 High Frequency Pulse Output)
Range: 0-50 m/s
Accuracy: +/- 5% > 5 m/s or 0.2 m/s < 5 m/s
Resolution: 0.1 m/s
Wind Speed Output: Linear, Calm = 3Hz, 50 m/s = 140 Hz

Wiring

SS100	CR1000
P	P1
G	⏚

Multiplier and offset calculation:
Using the equation of a line with two known points (0,3) and (50,140):
y=mx + b; m = (50-0) / (140-3) = 0.365 m/s / Hz
b=y-mx; 50 - .365(140) = -1.095 m/s

CRBasic measurement instruction:
PulseCount (WS_ms,1,1 ,0,1,.365,-1.095) 'configured for high frequency

CR1000 Wind Speed and Wind Direction Example

```
'CR1000 Series Datalogger

'Declare Public Variables
Public WS_ms, WindDir

'Define Data Tables
DataTable (SS100,true,-1)
    DataInterval (0,60,Sec,10)
    WindVector (1,WS_ms,WindDir,FP2,False,0,0,0)
    FieldNames ("WS_ms,WindDir,WindDir_SD1")
EndTable

'Main Program
BeginProg
    Scan (1,Sec,0,0)

        'Analog Output - Simulated Wind Direction
        VoltSe (WindDir,1,mv2500C,1,1,0,_60Hz,360/2200,0)

        'Pulse Output - Simulated Wind Speed
        PulseCount (WS_ms,1,1 ,0,1,.365,-1.095)    'high frequency Hz

        'Call Output Tables
        CallTable SS100

    NextScan
EndProg
```

4. Tipping Bucket Rain Gage Simulation

Sensor: Tipping Bucket Rain Gage

Signal Output: Momentary switch closure activated by tipping bucket mechanism.

Rainfall per tip: 0.01 in.

Wiring

SS100	CR1000
P	P2
G	⏚

CR1000 Tipping Bucket Rain Gage Simulation Example

```
'CR1000
'Declare Variables and Units

Public rain_fall

Units rain_fall=inch

'Define Data Tables
DataTable (rain_fall,True,-1)
    DataInterval (0,1,Min,0)
    Totalize (1,rain_fall,FP2,0)
EndTable

'Main Program
BeginProg
    Scan (1,Sec,1,0)
        'Tipping bucket 0.01" per tip.
        PulseCount (rain_fall,1,2,2,0,0.01,0)
        CallTable (rain_fall)
    NextScan
EndProg
```

5. Water Level Pressure Transducer Simulation

Sensor: Submersible pressure transducer

Input: Precise excitation voltage 2.5 VDC

Output: Full bridge differential voltage, linear output, maximum negative voltage equivalent to zero pressure, maximum positive output equivalent to maximum pressure. Must calibrate in field to determine offset and maximum and minimum pressures.

Wiring

SS100	CR1000
Vin	EX1
V1out	2H
V2out	2L
G	⏚

Multiplier and offset calculation:

Results with mult = 1, offset = 0, minimum depth = -177, maximum = 500. Assuming the range of the sensor is 0-100 feet, calculate the multiplier and offset using equation of line; m = 0.15, offset = 26.14.

CRBasic measurement instruction:

BrFull (depth_ft,1,mv2500C,2,Vx1,1,2500,True ,True ,0,_60Hz,0.15,26.14)

CR1000 Water Level Pressure Transducer Simulation Example

```
'CR1000 Series Datalogger

'Declare Public Variables
Public depth_ft

'Define Data Tables
DataTable (SS100,true,-1)
    DataInterval (0,60,Sec,10)
    Minimum (1,depth_ft,FP2,0,False)
EndTable

'Main Program
BeginProg
    Scan (1,Sec,0,0)

        'Bridge Measurement - Simulated Water Level
        BrFull (depth_ft,1,mv2500C,2,Vx1,1,2500,True ,True ,0,_60Hz,0.15,26.14)

        'Call Output Tables
        CallTable SS100

    NextScan
EndProg
```

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