IAV Engineering

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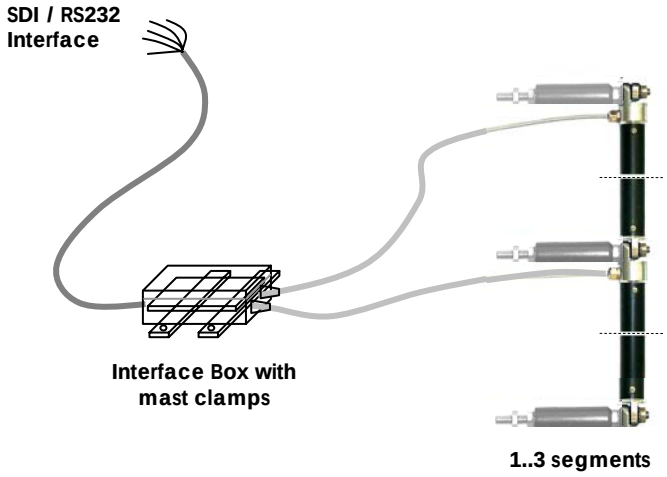
ALPINE NATURAL HAZARDS
AVALANCHE AND PERMAFROST
DEVELOPMENT & RESEARCH
MEASURING +WARNING SYSTEMS

FlowCapt Sensor

1 to 3 Segments
SDI / RS232
Interface Version

Product Update 2007



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*Flow*Capt SDI /RS232 Sensor

Product updates 2007

This manual describes the new FlowCapt SDI /RS232 Sensor interface electronics, wiring and operation (product updates 2007).

The interface is Campbell Scientific PackBus compatible.

For general installation refer to the *Flow*Capt manual.

Warranty

This equipment is guaranteed against defects in materials, workmanship and software. This guarantee applies for twelve months from date of delivery. We will repair products which prove to be defective during the guarantee period provided they are returned to us prepaid. The guarantee will not apply to:

- Equipment modified is altered by the customer.
- Any product subjected to misuse or damage in transit.

AlpuG and IAV are not liable for any consequential damage. Please inform AlpuG or IAV before returning equipment with a clear description of the faults.

Description

The FlowCapt interface electronics samples snow drift and wind of up to 3 FC elements at a 15s sampling interval. The interface includes amplification, filtering, digitizing, and linearization of the FlowCapt output. The interface includes an analogue board for powering, amplification, filtering and multiplexing FlowCapt sensors. A Cr200 with a special firmware and programming serves as a SDI or PB sensor. The interface can be connected to any SDI recorder. Programming examples are given for CR1000 and CR10x loggers from Campbell SCI. The RS232 output connects also to PC (COMport) running Loggernet or PC200w software (free download from www.campbellsci.com). The interface can also be connected to GSM, Phone modems, Spread spectrum PB radio systems (refer to Campbell SCI).

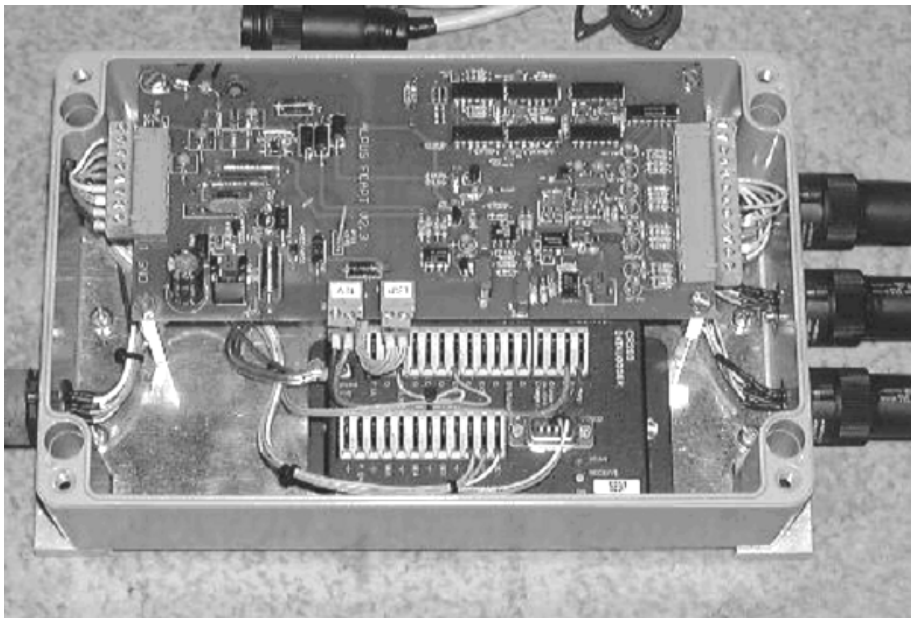
Specifications

Power requirements:	11 - 14.5V DC (12V battery).
	Or 16 to 20 V DC unregulated from solar cells.
Current:	1mA between measurement, 20mA during processing (3 sec. per sample), mean > 5mA, add 3 mA for unregulated power.
Output:	SDI-12, serial ASCII (1200Baud).
	PackBus Campbell SCI RS232 serial.
Temperature:	-25 to + 40°C.
Cables:	Maximum cable lengths between sensor and interface 15m.
	Maximum cable length for SDI 60m, for PB RS232 30m.
Dimensions:	40 x 18 x 13 cm (l x w x h) including connectors.
Weight:	3kg.
Clamps:	30 - 80mm.

Installation

The interface box can be mounted directly to pylons with diameters from 30 to 80mm. If sensors, interface box and data recorder are not mounted to the same pylon, very good ground wire connections between sensor mounting arms, interface case and data recorder ground have to be provided.

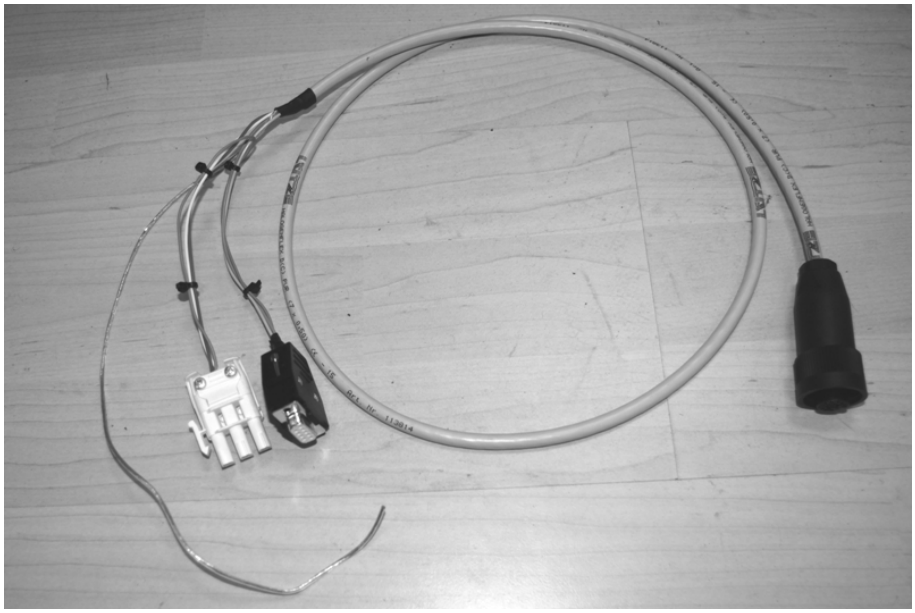
Furniture overview



- 1 to 3 interchangeable Flowcapt segments incl. M10 arms and 10m extension cable.
- Interface Box incl. universal pylon clamps.
- Cable to connect interface to datarecorder and additionnal service cable to connect interface to PC running Loggernet or PC200w or the RS232pPort of any PB logger.

Note : The interface box contains desiccant and should not be opened.

Recorder cable



7 pins Binder plug (included):

- 1 green battery 12V DC (11 to 14.5V)
- 2 white GND
- 3 brown charger in 16-20V DC
- 4 yellow SDI
- 5 grey TX RS232 pin 2
- 6 orange RX RS232 pin 3
- 7 Shield (middle pin)

Documentation

CD included providing further technical information, PC200w, special firmware and compiler for the Cr200, data acquisition program, sample programs for data recorder for CR10x and Cr1000, and a description of the interface electronics.

SDI -12 Operations

Most loggers today have SDI capability. Programming examples are given for Cr10x and Cr1000 loggers. SDI-12 is a Serial Digital Interface standard that is widely used for communication between data recorders and sensors.

The interface is shipped with fixed SDI address 3. The address is fixed as a constant of the data acquisition program running in the CR200 and should only be changed by experienced personal.

The data are subdivided into 3 blocks of 6 values:

sdi1(): Gliding 10min means of flux 1...3, wind index1..3.

sdi2(): Last measurement of flux 1...3, wind index1..3.

sdi3(): Test measuremets of flux 1...3, 1s timer since power up, sampling counter since power up.

Each block can be read individually with aR0!, aR1! and aR2! or aM0!...aM2!. (Refer to the program examples hereafter). In most cases data will be read with aR0! every 10 minutes (sliding mean values) and the control data will be read with aR2! every hour.

FC control data are updated every hour by activating an internal loudspeaker in each segment. The resulting control fluxes should be larger than 100. For online testing aR1! can be used that provides the last actual measurement for testing. Individual measurements do not provide good information on typical flux and wind.

Means of 10 to 60min provide good information on typical snow transport and wind.

SDI-12 CR10x Program Example

```
;{CR10X}

; CR10x Series Datalogger
; Fcapt sample 2 SDI recorder program
; date: 25.2.07
; program author: Gubler, AlpuG

; sdi1(): gliding 10min means of flux 1...3, wind index1..3
; sdi2(): last measurement of flux 1...3, wind index1..3
; sdi3(): test measuremets of flux 1...3, 1s timer since power up, sampling
counter since p.u.

; SDI snsensor connecte to C-Port 5
; SDI address 3

;
*Table 1 Program
  01: 5         Execution Interval (seconds)

1:  Batt Voltage (P10)
 1: 1        Loc [ Battvolt  ]

2:  Internal Temperature (P17)
 1: 2        Loc [ Loggertmp ]

; record FC SDI data at Interval >= 30sec, <= 10min
; if more than 1 set is recorded record different sets 5s apart not to
block
; FC sensor

3:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 10       Interval (same units as above)
 3: 30       Then Do

; record gliding mean for snow transport 1..3 and Wind index 1...3

    4:  SDI-12 Recorder (P105)
     1: 3        SDI-12 Address
     2: 20       Continuous Measurements (aR0!)
     3: 5        Port
     4: 10       Loc [ sdi1_1    ]
     5: 1.0      Multiplier
```

```
     6: 0.0      Offset

5:  End (P95)

6:  If time is (P92) ; only for testing
 1: 5      -- Minutes (Seconds --) into a
 2: 30       Interval (same units as above)
 3: 30       Then Do

; record last actual FC measurement for snow transport 1..3 and Wind index
1...3

    7:  SDI-12 Recorder (P105)
     1: 3        SDI-12 Address
     2: 21       Continuous Measurements (aR1!)
     3: 5        Port
     4: 16       Loc [ sdi2_1    ]
     5: 1.0      Multiplier
     6: 0.0      Offset

8:  End (P95)

; record test values snow transport test values 1...3, 1 second counter
since power up,
; sample counter, FC PS voltage. These values are only updated every hour

9:  If time is (P92)
 1: 1        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 30       Then Do

    10:  SDI-12 Recorder (P105)
     1: 3        SDI-12 Address
     2: 22       Continuous Measurements (aR2!)
     3: 5        Port
     4: 22       Loc [ sdi3_1    ]
     5: 1.0      Multiplier
     6: 0.0      Offset

11:  End (P95)

; data storage

12:  If time is (P92)
 1: 1        Minutes (Seconds --) into a
 2: 10       Interval (same units as above)
 3: 10       Set Output Flag High (Flag 0)

13:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 100      Array ID

14:  Real Time (P77)
 1: 110      Day,Hour/Minute (midnight = 0000)

15:  Sample (P70)
 1: 6        Reps
 2: 10       Loc [ sdi1_1    ]

16:  Sample (P70)
 1: 6        Reps
 2: 22       Loc [ sdi3_1    ]

*Table 2 Program
  02: 0.0000    Execution Interval (seconds)

*Table 3 Subroutines
```

```
End Program

1       [ Battvolt  ]  -W--   0       1       ----- ------ ---
2       [ Loggertmp ]  -W--   0       1       ----- ------ ---
3       [ _________ ]  ----   0       0       ----- ------ ---
4       [ _________ ]  ----   0       0       ----- ------ ---
5       [ _________ ]  ----   0       0       ----- ------ ---
6       [ _________ ]  ----   0       0       ----- ------ ---
7       [ _________ ]  ----   0       0       ----- ------ ---
8       [ _________ ]  ----   0       0       ----- ------ ---
9       [ _________ ]  ----   0       0       ----- ------ ---
10      [ sdi1_1    ]  RWM-   1       1       Start ------ ---
11      [ sdi1_2    ]  R-M-   1       0       ----- Member ---
12      [ sdi1_3    ]  R-M-   1       0       ----- Member ---
13      [ sdi1_4    ]  R-M-   1       0       ----- Member ---
14      [ sdi1_5    ]  R-M-   1       0       ----- Member ---
15      [ sdi1_6    ]  R-M-   1       0       ----- ------ End
16      [ sdi2_1    ]  -WM-   0       1       Start ------ ---
17      [ sdi2_2    ]  --M-   0       0       ----- Member ---
18      [ sdi2_3    ]  --M-   0       0       ----- Member ---
19      [ sdi2_4    ]  --M-   0       0       ----- Member ---
20      [ sdi2_5    ]  --M-   0       0       ----- Member ---
21      [ sdi2_6    ]  --M-   0       0       ----- ------ End
22      [ sdi3_1    ]  RWM-   1       1       Start ------ ---
23      [ sdi3_2    ]  R-M-   1       0       ----- Member ---
24      [ sdi3_3    ]  R-M-   1       0       ----- Member ---
25      [ sdi3_4    ]  R-M-   1       0       ----- Member ---
26      [ sdi3_5    ]  R-M-   1       0       ----- Member ---
27      [ sdi3_6    ]  R-M-   1       0       ----- ------ End
Program instruction 105 initiates SDI measurements
```

SDI-12 CR1000 Program Example

```
'CR1000 Series Datalogger
'Fcapt sample 2 SDI recorder program
'date: 25.2.07
'program author: Gubler, AlpuG

'Declare Public Variables
'sdi1(): gliding 10min means of flux 1...3, wind index1..3
'sdi2(): last measurement of flux 1...3, wind index1..3
'sdi3(): test measuremets of flux 1...3, 1s timer since power up, sampling
' counter since p.u.

Public sdi1(6), sdi2(6),sdi3(6), batt_volt, ptemp

'Define Data Tables

SequentialMode

DataTable (Test,1,-1)
   DataInterval (0,10,Min,10)
   Minimum (1,batt_volt,FP2,0,False)
   Sample (6,sdi1(),FP2)
EndTable

'Main Program
BeginProg
   Scan (5,Sec,0,0)
       PanelTemp (PTemp,250)
       Battery (Batt_volt)
```

```
'record FC SDI data at Interval >= 30sec, <= 10min
' if more than 1 set is recorded record different sets 5s apart not
to
‘ block FC sensor

      if IfTime (0,10,Min) then

' record gliding mean for snow transport 1..3 and Wind index 1...3

          SDI12Recorder (sdi1(),5,3,"R!",1.0,0)
      endif

' record last actual FC measurement for snow transport 1..3 and
Wind index ‘1...3

      if IfTime (5,30,Sec) then 'only for testing
          SDI12Recorder (sdi2(),5,3,"R1!",1.0,0)
      endif
      if IfTime (1,60,Min) then

' record test values snow transport test values 1...3, 1 second
counte
‘ since power up,
' sample counter, FC PS voltage. These values are only updated
every hour

          SDI12Recorder (sdi3(),5,3,"R2!",1.0,0)
      endif

'Enter other measurement instructions
'Call Output Tables

      CallTable Test
   NextScan
EndProg
```