TARFALA RESEARCH STATION

Tarfala Research Station automatic weather station, 1996

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MONITORING REPORT

April 12, 2016

Contents

1 Instrumentation

The TRS met station consisted of the following instruments during 1996

Sensor	Serial number	Remark
Pt100		in Stevenson screen
Pt100		in Young screen
T/Rh		at 2 m
Young Wind Monitor		at 3 m
LiCor Li-200SB pyranometer		at 2 m
Tipping bucket precipitation gauge		at 2 m
SR-50		at 2.45 m
CR10 data logger		

2 Notes on the station data

- Some original logger files are missing and existing data files are based on processed data.
- Logger program changed on 17 May, see program code tables below for details on changes. Timing of change is uncertain but could be around noon.
- New logger program implemented during 1996-09-13 16:00:00 to 1996-09-13 18:00:00
- After reprogramming daily maximum wind speed recordings are wrong. Appears to be daily average wind speeds instead.
- Additional changes to wind data is the addition of standard deviation of wind direction.
- after reprogramming 1996-09-13 18:00:00 SR-50 added to station recording snow depth. SR50 data added as average and sample values at the end of each recording. Values also saved in place of precipitation data on daily output

3 Data coverage

- Breaks in data between
  1996-09-13 17:00:00 due to reprogramming

- Temperature data missing from
  1996-09-13 17:00:00

- Radiation data missing from
  1996-01-13 16:00:00 to 1996-01-14 14:00:00
  1996-09-13 16:00:00 to 1996-09-13 17:00:00

- Precipitation data missing from
  1996-01-13 16:00:00 to 1996-01-14 14:00:00
  1996-09-13 16:00:00 to 1996-09-13 17:00:00
  1996-09-13 15:00:00 to 1997-01-01 00:00:00, sensor likely removed during winter

- Wind data missing from
  1996-09-13 16:00:00 to 1996-09-13 17:00:00

4 Notes on data storage

Example of data before change in logger program on 1996-09-13 17:00:00:
`1996,185,1300,11.78,11.9,12.04,36.46,3.204,153.6,NaN,435.1,0,NaN,NaN`

Column	Example data	Description
01:	`1996`	Year
02:	`185`	Day of Year
03:	`1300`	hour-minute (hhmm)
04:	`11.78`	2 Pt100 T in Stevenson screen)
05:	`11.9`	3 T in Young screen
06:	`12.04`	4 Pt100 in new Young screen
07:	`36.46`	5 Rh in Young screen
08:	`3.204`	6 Mean horizontal wind speed
09:	`153.6`	7 resultant mean wind direction
10:	`NaN`	8
11:	`435.1`	9 Global radiation
12:	`0`	10 Precipitation
13:	`NaN`	11
14:	`NaN`	12

Example of data after change in logger program on 1996-09-13 17:00:00:
`1996,257,1900,0.37,0.639,0.511,68.58,1.14,343,0.055,-12.68,NaN,0.002,-0.001`

Column	Example data	Description
01:	`1996`	Year
02:	`257`	Day of Year
03:	`1900`	hour-minute (hhmm)
04:	`0.37`	2 Pt100 T in Stevenson screen)
05:	`0.639`	3 T in Young screen
06:	`0.511`	4 Pt100 in new Young screen
07:	`99.58`	5 Rh in Young screen
08:	`1.14`	6 Mean horizontal wind speed
09:	`343`	7 resultant mean wind direction
10:	`0.055`	8 Standard deviation of wind direction
11:	`-12.68`	9 Global radiation
12:	`NaN`	10 Precipitation (removed for winter = NaN)
13:	`0.002`	11 SR-50 average snow depth
14:	`-0.001`	12 SR-50 sample snow depth

Example of daily data summaries:
`124,1996,185,7,3,2400,9.44,9.5,9.5,50.71,13.12,1335,5.011,408,7.48,1816,2.307,325.6,161.2,0,14.96,13.92`

Column	Example data	Description
01:	124	ID
02:	1994	Year
03:	1	Month
04:	1	Day of Month
05:	1	Day of Year
06:	2400	hour-minute (hhmm)
07:	-12.96	2 Daily average T in Stevenson screen)
08:	-12.65	3 Daily T from T/Rh in Young screen
09:	-12.34	4 Daily T from T/Rh in Young screen
10:	61.96	5 daily average humidity in Young screen
11:	-9.52	6 Daily maximum temperature in Young screen
12:	2040	7 hhmm for maximum daily temperature
13:	-18.89	8 Daily minimum temperature in Young screen
14:	2351	9 hhmm for minimum daily temperature
15:	16.09	10 Maximum wind speed
16:	1549	11 hhmm for maximum wind speed
17:	2.725	12 Average wind speed
18:	132.1	13 Average wind direction
19:	-17.25	14 Incoming radiation
20:	0	15
21:	-13.58	16
22:	13.93	17 Battery voltage

Example of 'Synoptic' output:
`103,1996,185,7,3,1300,12.41`

Column	Example data	Description
01:	103	ID
02:	1996	Year
03:	7	Month
04:	3	Day of month
05:	1300	hour-minute (hhmm)
07:	12.41	Pt100 in Young screen

5 Data files and content

`TRSmet1996.csv` Raw data file

`TRS_met_1996_Precipitation.csv`
Date-time, hourly totalized P
`1996-01-01 01:00:00,0.0`

`TRS_met_1996_Radiation.csv`
Date-time, Global radiation
`1996-01-01 01:00:00,-17.64`

`TRS_met_1996_Relative_humidity.csv`
Date-time, hourly average Rh
`1996-01-01 01:00:00,65.7`

`TRS_met_1996_Snow_depth.csv`
Date-time, average snow depth, sample snow depth
`1996-12-31 23:00:00,0.832,0.831`

`TRS_met_1996_Temperature.csv`
Date-time, hourly average T (Stevenson), hourly average T (Young), hourly average T/Rh (Young)
`1996-01-01 01:00:00,-5.94,-5.82,-5.75`

`TRS_met_1996_Wind.csv`
Date-time, Mean horizontal wind speed, resultant mean wind direction
`1996-01-01 01:00:00,13.5,352.9`

`TRS_met_1996_Daily_data.csv`
Data columns follows description above
`1996-01-01 00:00:00,-7.33,-7.26,-7.11,61.1,-3.40,512,-9.62,2258,41.9,257,13.6,98.0,-17.4,0.2,-6.54,13.92`

The data collected during 1996 is summarized the figure 1 and Table 1.

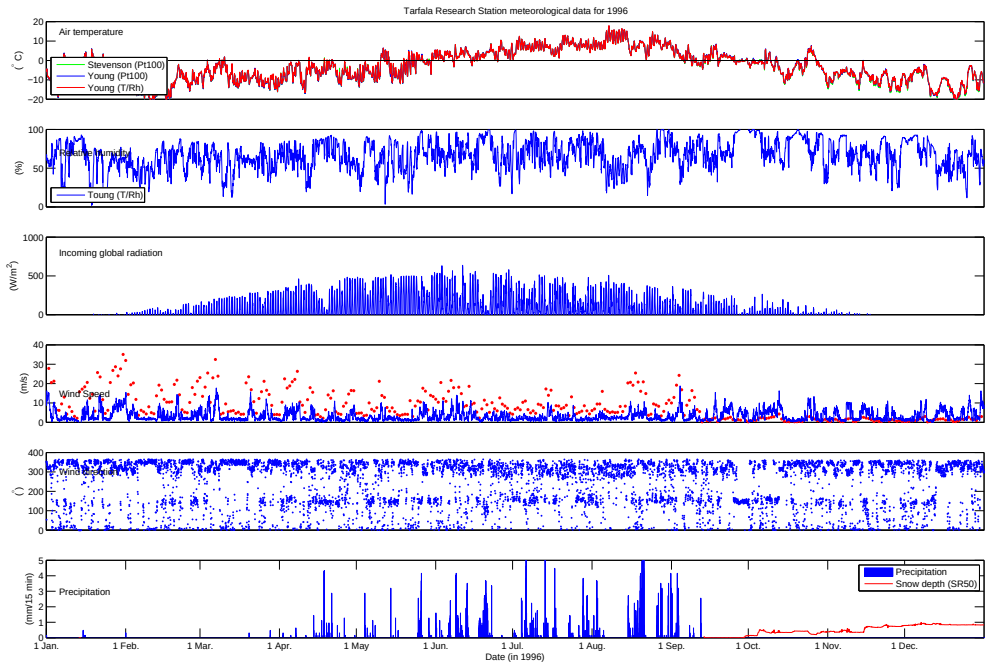

Figure. 1. Summary of meteorological data from Tarfala Research Station automatic weather station 1996.

Table. 1. Monthly averages of meteorological parameters from the Tarfala Research Station automatic weather station 1996.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average air temperature (Stevenson)												
(°C)	−5.0	−13.3	−8.4	−6.5	−3.5	3.2	7.3	9.1	1.7	−2.4	−9.1	−11.1
n	743	695	767	743	743	743	743	767	742	767	743	767
Average air temperature (Young)												
(°C)	−4.9	−13.2	−8.3	−6.6	−3.5	3.3	7.4	9.2	1.8	−2.2	−8.8	−10.9
n	743	695	767	743	743	743	743	767	742	767	743	767
Average air temperature												
(°C)	−4.9	−12.9	−8.2	−6.3	−3.3	3.2	7.3	9.1	1.7	−2.3	−8.8	−10.7
n	743	695	767	743	743	743	743	767	742	767	743	767
Positive degree sum												
(°C)	141	0	12	3	457	2495	5467	7058	–	517	0	0
n	77	0	10	10	202	699	743	767	–	186	1	0
Average relative humidity												
(%)	60.7	57.9	58.0	66.6	63.5	69.6	72.8	65.2	74.8	80.8	67.0	65.7
n	743	695	767	743	743	743	743	767	742	767	743	767
Average incoming global radiation												
($\mathrm{W\,m^{-2}}$)	−16.0	−4.2	40.4	87.0	157.1	138.9	96.0	79.0	33.7	4.4	−11.1	−14.0
n	720	695	767	743	743	743	743	767	741	767	743	767
Global incoming energy sum												
($\mathrm{W\,m^{-2}}$)	−76	5833	38479	69784	119762	105091	74201	65758	29533	10581	851	0
n	18	157	301	409	502	555	508	427	313	220	52	0
Totalized precipitation												
(mm)	1.76	0.64	0.96	25.60	40.00	179.52	114.40	188.80	48.48	0.00	0.00	0.00
n	720	695	767	743	743	743	743	767	326	0	0	0
Average wind speed												
($\mathrm{m\,s^{-1}}$)	3.9	3.4	3.7	2.9	2.4	3.2	2.2	2.8	3.8	3.8	3.4	3.9
n	743	695	767	743	743	743	743	767	741	767	743	767

Logger program

5.1 Program valid until 1996-05-17

```
;{CR10}
*Table 1 Program
  01: 10.0000   Execution Interval (seconds)

1:  Batt Voltage (P10)
 1: 10         Loc [ Batteri_V ]

2:  If (X<=>F) (P89)
 1: 10         X Loc [ Batteri_V ]
 2: 4          <
 3: 9.7        F
 4: 0          Go to end of Program Table

3:  3W Half Bridge (P7)
 1: 1          Reps
 2: 33         25 mV 50 Hz Rejection Range
 3: 1          SE Channel
 4: 1          Excite all reps w/Exchan 1
 5: 2100       mV Excitation
 6: 21         Loc [ Rs_Ro_T1  ]
 7: 100        Mult
 8: 0.0000     Offset

4:  3W Half Bridge (P7)
 1: 1          Reps
 2: 33         25 mV 50 Hz Rejection Range
 3: 3          SE Channel
 4: 2          Excite all reps w/Exchan 2
 5: 2100       mV Excitation
 6: 22         Loc [ Rs_Ro_T2  ]
 7: 100.00     Mult
 8: 0.0000     Offset

5:  Temperature RTD (P16)
 1: 2          Reps
 2: 21         R/R0 Loc [ Rs_Ro_T1  ]
 3: 1          Loc [ T1_bur__C ]
 4: 1          Mult
 5: 0.0000     Offset

6:  Do (P86)
 1: 41         Set Port 1 High

7:  Excitation with Delay (P22)
 1: 1          Ex Channel
 2: 200        Delay W/Ex (0.01 sec units)
 3: 25         Delay After Ex (0.01 sec units)
 4: 1          mV Excitation

8:  Volt (Diff) (P2)
 1: 2          Reps
 2: 35         2500 mV 50 Hz Rejection Range
 3: 3          DIFF Channel
 4: 3          Loc [ T3_Rot__C ]
 5: 0.1        Mult
```

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 6: 0.0000   Offset

9:  Do (P86)
 1: 51       Set Port 1 Low

10:  Pulse (P3)
 1: 1        Reps
 2: 1        Pulse Input Channel
 3: 21       Low Level AC, Output Hz
 4: 5        Loc [ Vhast_m_s ]
 5: 0.0098   Mult
 6: 0        Offset

11:  Excite-Delay (SE) (P4)
 1: 1        Reps
 2: 5        2500 mV Slow Range
 3: 9        SE Channel
 4: 3        Excite all reps w/Exchan 3
 5: 2        Delay (0.01 sec units)
 6: 2500     mV Excitation
 7: 6        Loc [ Vrikt____ ]
 8: 0.142    Mult
 9: 0.0000   Offset

12:  Volt (SE) (P1)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 10       SE Channel
 4: 7        Loc [ Sol__W_m_ ]
 5: 116.55   Mult
 6: 0.0000   Offset

13:  Pulse (P3)
 1: 1        Reps
 2: 2        Pulse Input Channel
 3: 2        Switch Closure, All Counts
 4: 8        Loc [ Nederb_mm ]
 5: 0.16     Mult
 6: 0.0000   Offset

14:  Internal Temperature (P17)
 1: 9        Loc [ Logtemp_C ]

15:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 10       Set Output Flag High

16:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 101      Array ID

17:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

18:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]
```

```
19:  Wind Vector (P69)
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 1        S, é1 Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

20:  Average (P71)
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]

21:  Totalize (P72)
 1: 1        Reps
 2: 8        Loc [ Nederb_mm ]

22:  Serial Out (P96)
 1: 71       Storage Module

23:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

24:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 124      Array ID

25:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

26:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]

27:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

28:  Minimum (P74)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

29:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 5        Loc [ Vhast_m_s ]

30:  Wind Vector (P69)
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 1        S, é1 Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

31:  Average (P71)
```

```
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]

32:  Totalize (P72)
 1: 1        Reps
 2: 8        Loc [ Nederb_mm ]

33:  Average (P71)
 1: 1        Reps
 2: 9        Loc [ Logtemp_C ]

34:  Sample (P70)
 1: 1        Reps
 2: 10       Loc [ Batteri_V ]

35:  Serial Out (P96)
 1: 71       Storage Module

36:  If time is (P92)
 1: 60       Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

37:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

38:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

39:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

40:  If time is (P92)
 1: 240      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

41:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

42:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

43:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

44:  If time is (P92)
 1: 420      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

45:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID
```

```
46:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

47:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

48:  If time is (P92)
 1: 600      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

49:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

50:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

51:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

52:  If time is (P92)
 1: 780      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

53:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

54:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

55:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

56:  If time is (P92)
 1: 960      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

57:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

58:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

59:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

60:  If time is (P92)
 1: 1140     Minutes (Seconds --) into a
```

```
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

61:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

62:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

63:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

64:  If time is (P92)
 1: 1320     Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

65:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

66:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

67:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

*Table 2 Program
  01: 0.0000    Execution Interval (seconds)

*Table 3 Subroutines

End Program


1      [ T1_bur__C ]  RW--   2       1      Start ------ ---
2      [ T2_skyd_C ]  RW--   12      1      ----- ------ End
3      [ T3_Rot__C ]  RW--   2       1      Start ------ ---
4      [ rH_Rot___ ]  RW--   2       1      ----- ------ End
5      [ Vhast_m_s ]  RW--   3       1      ----- ------ ---
6      [ Vrikt____ ]  RW--   2       1      ----- ------ ---
7      [ Sol__W_m_ ]  RW--   2       1      ----- ------ ---
8      [ Nederb_mm ]  RW--   2       1      ----- ------ ---
9      [ Logtemp_C ]  RW--   1       1      ----- ------ ---
10     [ Batteri_V ]  RW--   2       1      ----- ------ ---
11     [ _________ ]  ----   0       0      ----- ------ ---
12     [ _________ ]  ----   0       0      ----- ------ ---
13     [ _________ ]  ----   0       0      ----- ------ ---
14     [ _________ ]  ----   0       0      ----- ------ ---
15     [ _________ ]  ----   0       0      ----- ------ ---
16     [ _________ ]  ----   0       0      ----- ------ ---
17     [ _________ ]  ----   0       0      ----- ------ ---
18     [ _________ ]  ----   0       0      ----- ------ ---
19     [ _________ ]  ----   0       0      ----- ------ ---
20     [ _________ ]  ----   0       0      ----- ------ ---
```

21	[Rs_Ro_T1]	RW--	1	1	-----	------	---
22	[Rs_Ro_T2]	RW--	1	1	-----	------	---
23	[_____]	----	0	0	-----	------	---
24	[_____]	----	0	0	-----	------	---
25	[_____]	----	0	0	-----	------	---
26	[_____]	----	0	0	-----	------	---
27	[_____]	----	0	0	-----	------	---
28	[_____]	----	0	0	-----	------	---

5.2 Program valid from 1997-05-17 until 1996-09-13 16:00:00

```
;{CR10}
*Table 1 Program
  01: 10.0000   Execution Interval (seconds)

1:  Batt Voltage (P10)
 1: 10       Loc [ Batteri_V ]

2:  If (X<=>F) (P89)
 1: 10       X Loc [ Batteri_V ]
 2: 4        <
 3: 9.7      F
 4: 0        Go to end of Program Table

3:  3W Half Bridge (P7)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 1        SE Channel
 4: 1        Excite all reps w/Exchan 1
 5: 2100     mV Excitation
 6: 21       Loc [ Rs_Ro_T1  ]
 7: 100      Mult
 8: 0.0000   Offset

4:  3W Half Bridge (P7)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 3        SE Channel
 4: 2        Excite all reps w/Exchan 2
 5: 2100     mV Excitation
 6: 22       Loc [ Rs_Ro_T2  ]
 7: 100.00   Mult
 8: 0.0000   Offset

5:  Temperature RTD (P16)
 1: 2        Reps
 2: 21       R/R0 Loc [ Rs_Ro_T1  ]
 3: 1        Loc [ T1_bur__C ]
 4: 1        Mult
 5: 0.0000   Offset

6:  Do (P86)
 1: 41       Set Port 1 High

7:  Excitation with Delay (P22)
 1: 0        Ex Channel
 2: 200      Delay W/Ex (0.01 sec units)
 3: 25       Delay After Ex (0.01 sec units)
 4: 1        mV Excitation

8:  Volt (Diff) (P2)
 1: 2        Reps
 2: 35       2500 mV 50 Hz Rejection Range
 3: 3        DIFF Channel
 4: 3        Loc [ T3_Rot__C ]
 5: 0.1      Mult
 6: 0.0000   Offset
```

```
9:  Do (P86)
 1: 51       Set Port 1 Low

10:  Pulse (P3)
 1: 1        Reps
 2: 1        Pulse Input Channel
 3: 21       Low Level AC, Output Hz
 4: 5        Loc [ Vhast_m_s ]
 5: 0.0098   Mult
 6: 0        Offset

11:  Excite-Delay (SE) (P4)
 1: 1        Reps
 2: 5        2500 mV Slow Range
 3: 9        SE Channel
 4: 3        Excite all reps w/Exchan 3
 5: 2        Delay (0.01 sec units)
 6: 2500     mV Excitation
 7: 6        Loc [ Vrikt____ ]
 8: 0.142    Mult
 9: -135     Offset

12:  Volt (SE) (P1)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 10       SE Channel
 4: 7        Loc [ Sol__W_m_ ]
 5: 116.55   Mult
 6: 0.0000   Offset

13:  Pulse (P3)
 1: 1        Reps
 2: 2        Pulse Input Channel
 3: 2        Switch Closure, All Counts
 4: 8        Loc [ Nederb_mm ]
 5: 0.16     Mult
 6: 0.0000   Offset

14:  Internal Temperature (P17)
 1: 9        Loc [ Logtemp_C ]

15:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 10       Set Output Flag High

16:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 101      Array ID

17:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

18:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]

19:  Wind Vector (P69)
```

```
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 0        S, é1, & å(é1) Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

20:  Average (P71)
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]

21:  Totalize (P72)
 1: 1        Reps
 2: 8        Loc [ Nederb_mm ]

22:  Serial Out (P96)
 1: 71       Storage Module

23:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

24:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 124      Array ID

25:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

26:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]

27:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

28:  Minimum (P74)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

29:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 5        Loc [ Vhast_m_s ]

30:  Wind Vector (P69)
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 1        S, é1 Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

31:  Average (P71)
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]
```

```
32:  Totalize (P72)
 1: 1        Reps
 2: 8        Loc [ Nederb_mm ]

33:  Average (P71)
 1: 1        Reps
 2: 9        Loc [ Logtemp_C ]

34:  Sample (P70)
 1: 1        Reps
 2: 10       Loc [ Batteri_V ]

35:  Serial Out (P96)
 1: 71       Storage Module

36:  If time is (P92)
 1: 60       Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

37:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

38:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

39:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

40:  If time is (P92)
 1: 240      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

41:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

42:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

43:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

44:  If time is (P92)
 1: 420      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

45:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

46:  Real Time (P77)
```

```
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

47:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

48:  If time is (P92)
 1: 600      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

49:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

50:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

51:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

52:  If time is (P92)
 1: 780      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

53:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

54:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

55:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

56:  If time is (P92)
 1: 960      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

57:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

58:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

59:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

60:  If time is (P92)
 1: 1140     Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High
```

```
61:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

62:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

63:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

64:  If time is (P92)
 1: 1320     Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

65:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

66:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

67:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

*Table 2 Program
  01: 0.0000    Execution Interval (seconds)

*Table 3 Subroutines

End Program

1      [ T1_bur__C ]  RW--   2       1      Start ------ ---
2      [ T2_skyd_C ]  RW--   12      1      ----- ------ End
3      [ T3_Rot__C ]  RW--   2       1      Start ------ ---
4      [ rH_Rot___ ]  RW--   2       1      ----- ------ End
5      [ Vhast_m_s ]  RW--   3       1      ----- ------ ---
6      [ Vrikt____ ]  RW--   2       1      ----- ------ ---
7      [ Sol__W_m_ ]  RW--   2       1      ----- ------ ---
8      [ Nederb_mm ]  RW--   2       1      ----- ------ ---
9      [ Logtemp_C ]  RW--   1       1      ----- ------ ---
10     [ Batteri_V ]  RW--   2       1      ----- ------ ---
11     [ _________ ]  ----   0       0      ----- ------ ---
12     [ _________ ]  ----   0       0      ----- ------ ---
13     [ _________ ]  ----   0       0      ----- ------ ---
14     [ _________ ]  ----   0       0      ----- ------ ---
15     [ _________ ]  ----   0       0      ----- ------ ---
16     [ _________ ]  ----   0       0      ----- ------ ---
17     [ _________ ]  ----   0       0      ----- ------ ---
18     [ _________ ]  ----   0       0      ----- ------ ---
19     [ _________ ]  ----   0       0      ----- ------ ---
20     [ _________ ]  ----   0       0      ----- ------ ---
21     [ Rs_Ro_T1  ]  RW--   1       1      ----- ------ ---
22     [ Rs_Ro_T2  ]  RW--   1       1      ----- ------ ---
23     [ _________ ]  ----   0       0      ----- ------ ---
```

```
24     [ _________ ]  ----   0       0      ----- ------ ---
25     [ _________ ]  ----   0       0      ----- ------ ---
26     [ _________ ]  ----   0       0      ----- ------ ---
27     [ _________ ]  ----   0       0      ----- ------ ---
28     [ _________ ]  ----   0       0      ----- ------ ---
```

5.3 Program valid after 1996-09-13 18:00:00

```
;{CR10}
*Table 1 Program
  01: 10.0000   Execution Interval (seconds)

1:  Batt Voltage (P10)
 1: 10       Loc [ Batteri_V ]

2:  If (X<=>F) (P89)
 1: 10       X Loc [ Batteri_V ]
 2: 4        <
 3: 9.7      F
 4: 0        Go to end of Program Table

3:  3W Half Bridge (P7)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 1        SE Channel
 4: 1        Excite all reps w/Exchan 1
 5: 2100     mV Excitation
 6: 21       Loc [ Rs_Ro_T1  ]
 7: 100      Mult
 8: 0.0000   Offset

4:  3W Half Bridge (P7)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 3        SE Channel
 4: 2        Excite all reps w/Exchan 2
 5: 2100     mV Excitation
 6: 22       Loc [ Rs_Ro_T2  ]
 7: 100.00   Mult
 8: 0.0000   Offset

5:  Temperature RTD (P16)
 1: 2        Reps
 2: 21       R/R0 Loc [ Rs_Ro_T1  ]
 3: 1        Loc [ T1_bur__C ]
 4: 1        Mult
 5: 0.0000   Offset

6:  Do (P86)
 1: 41       Set Port 1 High

7:  Volt (Diff) (P2)
 1: 2        Reps
 2: 35       2500 mV 50 Hz Rejection Range
 3: 3        DIFF Channel
 4: 3        Loc [ T3_Rot__C ]
 5: 0.1      Mult
 6: 0.0000   Offset

8:  Pulse (P3)
 1: 1        Reps
 2: 1        Pulse Input Channel
 3: 21       Low Level AC, Output Hz
 4: 5        Loc [ Vhast_m_s ]
 5: 0.0098   Mult
```

```
 6: 0        Offset

9:  Excite-Delay (SE) (P4)
 1: 1        Reps
 2: 5        2500 mV Slow Range
 3: 9        SE Channel
 4: 3        Excite all reps w/Exchan 3
 5: 2        Delay (0.01 sec units)
 6: 2500     mV Excitation
 7: 6        Loc [ Vrikt____ ]
 8: 0.142    Mult
 9: -135     Offset

10:  If (X<=>F) (P89)
 1: 6        X Loc [ Vrikt____ ]
 2: 4        <
 3: 0        F
 4: 30       Then Do

11:  Z=X+F (P34)
 1: 6        X Loc [ Vrikt____ ]
 2: 360      F
 3: 6        Z Loc [ Vrikt____ ]

12:  End (P95)

13:  Volt (SE) (P1)
 1: 1        Reps
 2: 33       25 mV 50 Hz Rejection Range
 3: 10       SE Channel
 4: 7        Loc [ Sol__W_m_ ]
 5: 116.55   Mult
 6: 0.0000   Offset

14:  Internal Temperature (P17)
 1: 9        Loc [ Logtemp_C ]

15:  Do (P86)
 1: 42       Set Port 2 High

16:  Excitation with Delay (P22)
 1: 1        Ex Channel
 2: 1        Delay W/Ex (0.01 sec units)
 3: 0        Delay After Ex (0.01 sec units)
 4: 1        mV Excitation

17:  Do (P86)
 1: 52       Set Port 2 Low

18:  Pulse (P3)
 1: 1        Reps
 2: 2        Pulse Input Channel
 3: 0        High Frequency, All Counts
 4: 23       Loc [ Avstand_m ]
 5: -.0025   Mult
 6: 0.0000   Offset

19:  Z=X+F (P34)
```

```
 1: 2        X Loc [ T2_skyd_C ]
 2: 273.15   F
 3: 24       Z Loc [ T_SR50__K ]

20:  Z=F x 10^n (P30)
 1: 273.15   F
 2: 0        n, Exponent of 10
 3: 25       Z Loc [ Ref_Temp_ ]

21:  Z=X/Y (P38)
 1: 24       X Loc [ T_SR50__K ]
 2: 25       Y Loc [ Ref_Temp_ ]
 3: 26       Z Loc [ Mult_     ]

22:  Z=SQRT(X) (P39)
 1: 26       X Loc [ Mult_     ]
 2: 26       Z Loc [ Mult_     ]

23:  Z=X*Y (P36)
 1: 23       X Loc [ Avstand_m ]
 2: 26       Y Loc [ Mult_     ]
 3: 23       Z Loc [ Avstand_m ]

24:  Z=X+F (P34)
 1: 23       X Loc [ Avstand_m ]
 2: 2.45     F
 3: 11       Z Loc [ Snodjup_m ]

25:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 10       Set Output Flag High

26:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 101      Array ID

27:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

28:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]

29:  Wind Vector (P69)
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 0        S, é1, & å(é1) Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

30:  Average (P71)
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]

31:  Average (P71)
 1: 1        Reps
 2: 11       Loc [ Snodjup_m ]
```

```
32:  Sample (P70)
 1: 1        Reps
 2: 11       Loc [ Snodjup_m ]

33:  Serial Out (P96)
 1: 71       Storage Module

34:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

35:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 124      Array ID

36:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

37:  Average (P71)
 1: 4        Reps
 2: 1        Loc [ T1_bur__C ]

38:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

39:  Minimum (P74)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 2        Loc [ T2_skyd_C ]

40:  Maximum (P73)
 1: 1        Reps
 2: 10       Value with Hr-Min
 3: 5        Loc [ Vhast_m_s ]

41:  Wind Vector (P69)
 1: 1        Reps
 2: 1        Samples per Sub-Interval
 3: 1        S, é1 Polar
 4: 5        Wind Speed/East Loc [ Vhast_m_s ]
 5: 6        Wind Direction/North Loc [ Vrikt____ ]

42:  Average (P71)
 1: 1        Reps
 2: 7        Loc [ Sol__W_m_ ]

43:  Average (P71)
 1: 1        Reps
 2: 11       Loc [ Snodjup_m ]

44:  Sample (P70)
 1: 1        Reps
 2: 11       Loc [ Snodjup_m ]
```

```
45:  Sample (P70)
 1: 1        Reps
 2: 10       Loc [ Batteri_V ]

46:  Serial Out (P96)
 1: 71       Storage Module

47:  If time is (P92)
 1: 60       Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

48:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

49:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

50:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

51:  If time is (P92)
 1: 240      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

52:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

53:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

54:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

55:  If time is (P92)
 1: 420      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

56:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

57:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

58:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

59:  If time is (P92)
 1: 600      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
```

```
 3: 10       Set Output Flag High

60:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

61:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

62:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

63:  If time is (P92)
 1: 780      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

64:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

65:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

66:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

67:  If time is (P92)
 1: 960      Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

68:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

69:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

70:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

71:  If time is (P92)
 1: 1140     Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

72:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

73:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

74:  Sample (P70)
```

```
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

75:  If time is (P92)
 1: 1320     Minutes (Seconds --) into a
 2: 1440     Interval (same units as above)
 3: 10       Set Output Flag High

76:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 103      Array ID

77:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

78:  Sample (P70)
 1: 1        Reps
 2: 2        Loc [ T2_skyd_C ]

*Table 2 Program
  01: 0.0000    Execution Interval (seconds)

1:  Do (P86)
 1: 42       Set Port 2 High

2:  Excitation with Delay (P22)
 1: 1        Ex Channel
 2: 1        Delay W/Ex (0.01 sec units)
 3: 0        Delay After Ex (0.01 sec units)
 4: .0000    mV Excitation

3:  Do (P86)
 1: 52       Set Port 2 Low

4:  Pulse (P3)
 1: 1        Reps
 2: 2        Pulse Input Channel
 3: 0        High Frequency, All Counts
 4: 23       Loc [ Avstand_m ]
 5: -.0025   Mult
 6: 0.0000   Offset

5:  Z=X+F (P34)
 1: 2        X Loc [ T2_skyd_C ]
 2: 273.15   F
 3: 24       Z Loc [ T_SR50__K ]

6:  Z=F x 10^n (P30)
 1: 273.15   F
 2: 0        n, Exponent of 10
 3: 25       Z Loc [ Ref_Temp_ ]

7:  Z=X/Y (P38)
 1: 24       X Loc [ T_SR50__K ]
 2: 25       Y Loc [ Ref_Temp_ ]
 3: 26       Z Loc [ Mult_     ]

8:  Z=SQRT(X) (P39)
```

```
 1: 26       X Loc [ Mult_     ]
 2: 26       Z Loc [ Mult_     ]

9:  Z=X*Y (P36)
 1: 23       X Loc [ Avstand_m ]
 2: 26       Y Loc [ Mult_     ]
 3: 23       Z Loc [ Avstand_m ]

10:  Z=X+F (P34)
 1: 23       X Loc [ Avstand_m ]
 2: 2.47     F
 3: 11       Z Loc [ Snodjup_m ]

*Table 3 Subroutines

End Program

1      [ T1_bur__C ]  RW--   2       1      Start ------ ---
2      [ T2_skyd_C ]  RW--   14      1      ----- ------ End
3      [ T3_Rot__C ]  RW--   2       1      Start ------ ---
4      [ rH_Rot___ ]  RW--   2       1      ----- ------ End
5      [ Vhast_m_s ]  RW--   3       1      ----- ------ ---
6      [ Vrikt____ ]  RW--   4       2      ----- ------ ---
7      [ Sol__W_m_ ]  RW--   2       1      ----- ------ ---
8      [ Nederb_mm ]  ----   0       0      ----- ------ ---
9      [ Logtemp_C ]  -W--   0       1      ----- ------ ---
10     [ Batteri_V ]  RW--   2       1      ----- ------ ---
11     [ Snodjup_m ]  RW--   4       2      ----- ------ ---
12     [ _________ ]  ----   0       0      ----- ------ ---
13     [ _________ ]  ----   0       0      ----- ------ ---
14     [ _________ ]  ----   0       0      ----- ------ ---
15     [ _________ ]  ----   0       0      ----- ------ ---
16     [ _________ ]  ----   0       0      ----- ------ ---
17     [ _________ ]  ----   0       0      ----- ------ ---
18     [ _________ ]  ----   0       0      ----- ------ ---
19     [ _________ ]  ----   0       0      ----- ------ ---
20     [ _________ ]  ----   0       0      ----- ------ ---
21     [ Rs_Ro_T1  ]  RW--   1       1      ----- ------ ---
22     [ Rs_Ro_T2  ]  RW--   1       1      ----- ------ ---
23     [ Avstand_m ]  RW--   4       4      ----- ------ ---
24     [ T_SR50__K ]  RW--   2       2      ----- ------ ---
25     [ Ref_Temp_ ]  RW--   2       2      ----- ------ ---
26     [ Mult_     ]  RW--   4       4      ----- ------ ---
27     [ _________ ]  ----   0       0      ----- ------ ---
28     [ _________ ]  ----   0       0      ----- ------ ---
```