Meteorology 433

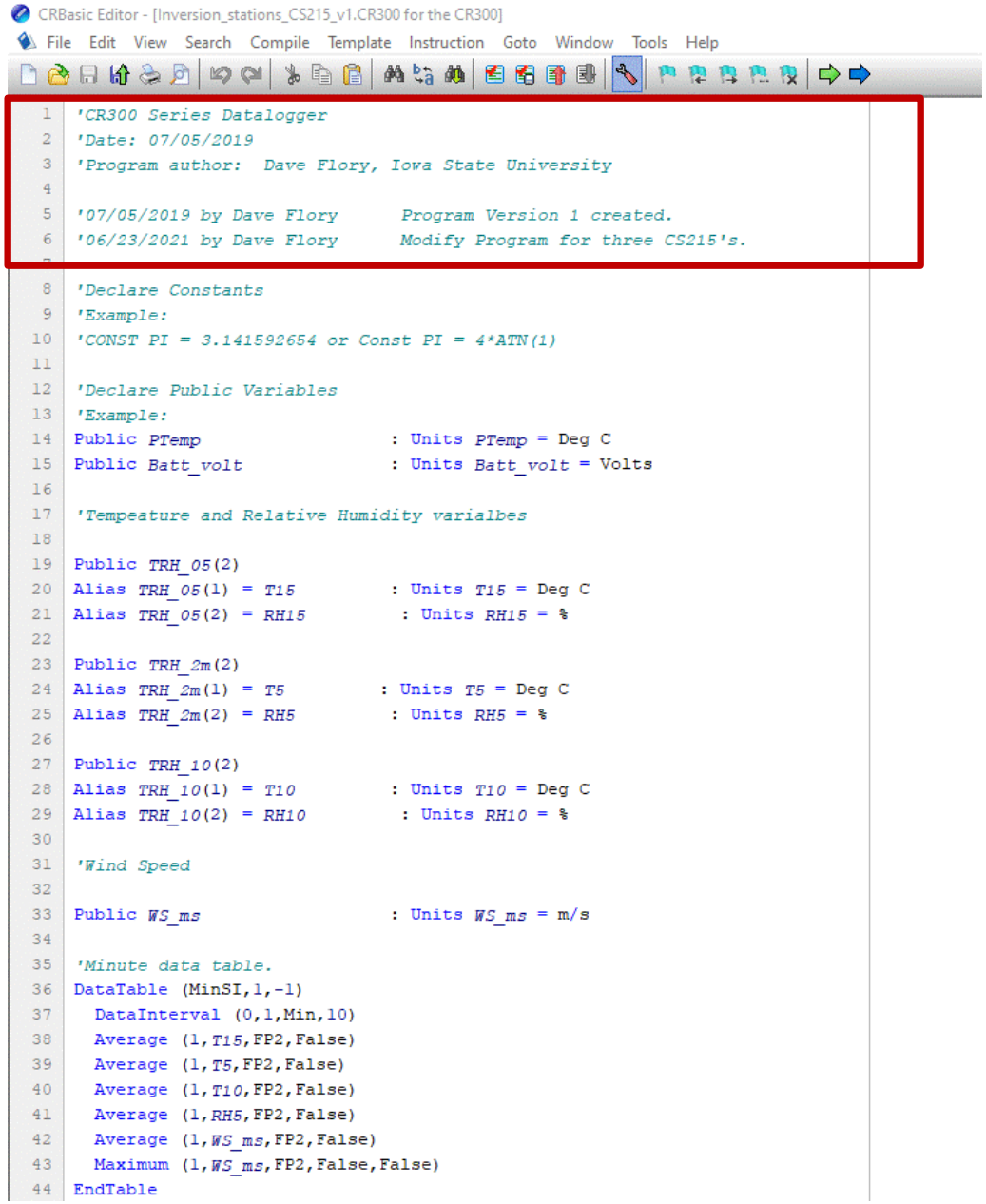
Campbell Scientific Programing Language with CRBasic

Spring 2022

Program Sections

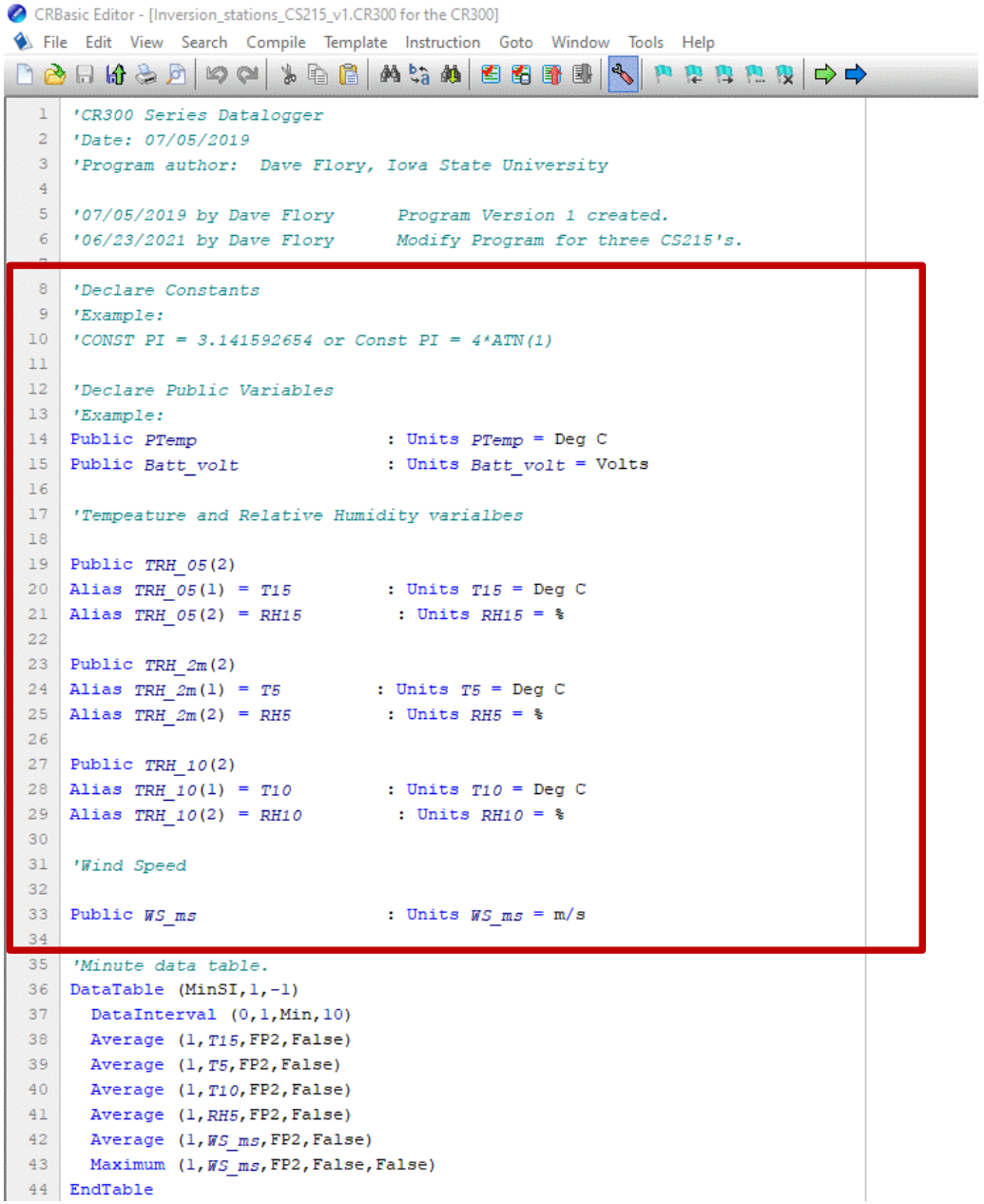
- Header
  - Comments and updates
- Declaration section
  - Constants, variables, and aliases
  - Units: Units can be specified, but they do not impact the program
  - They only appear in output table headers.
- Data table definitions
- Main program
- Programs can have subroutines

Header




```
1  'CR300 Series Datalogger
2  'Date: 07/05/2019
3  'Program author:  Dave Flory, Iowa State University
4
5  '07/05/2019 by Dave Flory       Program Version 1 created.
6  '06/23/2021 by Dave Flory       Modify Program for three CS215's.
7
8  'Declare Constants
9  'Example:
10 'CONST PI = 3.141592654 or Const PI = 4*ATN(1)
11
12 'Declare Public Variables
13 'Example:
14 Public PTemp                 : Units PTemp = Deg C
15 Public Batt_volt             : Units Batt_volt = Volts
16
17 'Tempeature and Relative Humidity varialbes
18
19 Public TRH_05(2)
20 Alias TRH_05(1) = T15         : Units T15 = Deg C
21 Alias TRH_05(2) = RH15         : Units RH15 = %
22
23 Public TRH_2m(2)
24 Alias TRH_2m(1) = T5          : Units T5 = Deg C
25 Alias TRH_2m(2) = RH5          : Units RH5 = %
26
27 Public TRH_10(2)
28 Alias TRH_10(1) = T10         : Units T10 = Deg C
29 Alias TRH_10(2) = RH10         : Units RH10 = %
30
31 'Wind Speed
32
33 Public WS_ms                  : Units WS_ms = m/s
34
35 'Minute data table.
36 DataTable (MinSI,1,-1)
37   DataInterval (0,1,Min,10)
38   Average (1,T15,FP2,False)
39   Average (1,T5,FP2,False)
40   Average (1,T10,FP2,False)
41   Average (1,RH5,FP2,False)
42   Average (1,WS_ms,FP2,False)
43   Maximum (1,WS_ms,FP2,False,False)
44 EndTable
```

Declaration Section



Data table definitions

```
'Minute data table.
DataTable (MinSI,1,-1)
  DataInterval (0,1,Min,10)
  Average (1,T15,FP2,False)
  Average (1,T5,FP2,False)
  Average (1,T10,FP2,False)
  Average (1,RH5,FP2,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,False)
EndTable

'Hourly data table.
DataTable (HourlySI,1,-1 )
  DataInterval (0,1,Hr,10)
  Minimum (1,Batt_volt,FP2,False,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Daily data table.
DataTable (DailySI,1,-1)
  DataInterval (0,1,Day,10)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)
```

- DataTable
  - Gives a name to the data table.

Data table definitions

```
'Minute data table.
DataTable (MinuteSI,1,-1)
  DataInterval (0,1,Min,10)
  Average (1,T5,FP2,False)
  Average (1,T10,FP2,False)
  Average (1,RH5,FP2,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,False)
EndTable

'Hourly data table.
DataTable (HourlySI,1,-1 )
  DataInterval (0,1,Hr,10)
  Minimum (1,Batt_volt,FP2,False,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Daily data table.
DataTable (DailySI,1,-1)
  DataInterval (0,1,Day,10)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)
```

- DataTable
  - Gives a name to the data table.
- DataInterval
  - Define the interval that data in the table will be recorded.
  - Units can be mSec, Sec, Min, Hr, Day, Mon

Data table definitions

```
'Minute data table.
DataTable (MinSI,1,-1)
  DataInterval (0,1,Min,10)
  Average (1,T15,FP2,False)
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  Average (1,T10,FP2,False)
  Average (1,RH5,FP2,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,False)
EndTable

'Hourly data table.
DataTable (HourlySI,1,-1 )
  DataInterval (0,1,Hr,10)
  Minimum (1,Batt_volt,FP2,False,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Daily data table.
DataTable (DailySI,1,-1)
  DataInterval (0,1,Day,10)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)
```

- DataTable
  - Gives a name to the data table.
- DataInterval
  - Define the interval that data in the table will be recorded.
  - Units can be mSec, Sec, Min, Hr, Day, Mon
- Variables to be measured.
  - Sample, Average, Maximum, Minimum

Data table definitions

```
'Minute data table.
DataTable (MinSI,1,-1)
  DataInterval (0,1,Min,10)
  Average (1,T15,FP2,False)
  Average (1,T5,FP2,False)
  Average (1,T10,FP2,False)
  Average (1,RH5,FP2,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,False)
EndTable

'Hourly data table.
DataTable (HourlySI,1,-1 )
  DataInterval (0,1,Hr,10)
  Minimum (1,Batt_volt,FP2,False,False)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Daily data table.
DataTable (DailySI,1,-1)
  DataInterval (0,1,Day,10)
  Maximum (1,WS_ms,FP2,False,True)
  Maximum (1,T15,FP2,False,False)
  Maximum (1,T5,FP2,False,False)
  Maximum (1,T10,FP2,False,False)
  Maximum (1,RH5,FP2,False,False)
  Minimum (1,T15,FP2,False,False)
  Minimum (1,T5,FP2,False,False)
  Minimum (1,T10,FP2,False,False)
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)
```

- DataTable
  - Gives a name to the data table.
- DataInterval
  - Define the interval that data in the table will be recorded.
  - Units can be mSec, Sec, Min, Hr, Day, Mon
- Variables to be measured.
  - Sample, Average, Maximum, Minimum
- EndTable statement
  - Designates the end of the data table

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
    Battery (Batt_volt)

    'Power on SW12 for CS215s

    PortSet (SW12V,1 )

    'CS215 Temperature Measurements (All Heights)

    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
    SDI12Recorder (TRH_2m(),C1,1,"M!",1.0,0)
    SDI12Recorder (TRH_10(),C2,0,"M!",1.0,0)

    'Wind Speed Measurements

    PulseCount (WS_ms,1,P_SW,2,1,0.8,0.447)
    If WS_ms < 0.448 Then WS_ms=0.

    'Call Output Tables
    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
    Battery (Batt_volt)

    'Power on SW12 for CS215s

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    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
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    'Wind Speed Measurements

    PulseCount (WS_ms,1,P_SW,2,1,0.8,0.447)
    If WS_ms < 0.448 Then WS_ms=0.

    'Call Output Tables
    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.
- Scan statement
  - How often to take measurements.

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
    Battery (Batt_volt)

    'Power on SW12 for CS215s

    PortSet (SW12V,1 )

    'CS215 Temperature Measurements (All Heights)

    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
    SDI12Recorder (TRH_2m(),C1,1,"M!",1.0,0)
    SDI12Recorder (TRH_10(),C2,0,"M!",1.0,0)

    'Wind Speed Measurements

    PulseCount (WS_ms,1,P_SW,2,1,0.8,0.447)
    If WS_ms < 0.448 Then WS_ms=0.

    'Call Output Tables
    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.
- Scan statement
  - How often to take measurements.
- Instrument measurements
  - Code needed to take readings from instruments.

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
    Battery (Batt_volt)

    'Power on SW12 for CS215s

    PortSet (SW12V,1 )

    'CS215 Temperature Measurements (All Heights)

    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
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    If WS_ms < 0.448 Then WS_ms=0.

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    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.
- Scan statement
  - How often to take measurements.
- Instrument measurements
  - Code needed to take readings from instruments.
- CallTable statements
  - Calls output tables
  - Data will be written if interval is correct.

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
    Battery (Batt_volt)

    'Power on SW12 for CS215s

    PortSet (SW12V,1 )

    'CS215 Temperature Measurements (All Heights)

    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
    SDI12Recorder (TRH_2m(),C1,1,"M!",1.0,0)
    SDI12Recorder (TRH_10(),C2,0,"M!",1.0,0)

    'Wind Speed Measurements

    PulseCount (WS_ms,1,P_SW,2,1,0.8,0.447)
    If WS_ms < 0.448 Then WS_ms=0.

    'Call Output Tables
    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.
- Scan statement
  - How often to take measurements.
- Instrument measurements
  - Code needed to take readings from instruments.
- CallTable statements
  - Calls output tables
  - Data will be written if interval is correct.
- NextScan
  - End of current scan

Main Program

```
  Minimum (1,RH5,FP2,False,False)
EndTable

'Main Program
BeginProg
  Scan (5,Sec,0,0)

    'Monitor Panel temperature and battery voltage

    PanelTemp (PTemp,60)
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    SDI12Recorder (TRH_05(),C1,0,"M!",1.0,0)
    SDI12Recorder (TRH_2m(),C1,1,"M!",1.0,0)
    SDI12Recorder (TRH_10(),C2,0,"M!",1.0,0)

    'Wind Speed Measurements

    PulseCount (WS_ms,1,P_SW,2,1,0.8,0.447)
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    'Call Output Tables
    CallTable MinSI
    CallTable HourlySI
    CallTable DailySI
  NextScan
EndProg
```

- BeginProg
  - Designates the start of the main program.
- Scan statement
  - How often to take measurements.
- Instrument measurements
  - Code needed to take readings from instruments.
- CallTable statements
  - Calls output tables
  - Data will be written if interval is correct.
- NextScan
  - End of current scan
- EndProg
  - Designates the end of the main program