CR10X Data Collection Program
Version 131.0
8/26/2008

Station Type	Update Rate	Sensor Groups	Sensor Fields	Logging
Monument Cr Soils	10 minutes	None	None	Midnight

Revision History

CR10X data collection program version 131 is a special soils data gathering program for Monument Creek, logging midnight data from 9 Hydra II soil probes and one snow depth sensor.

- 131.0 was based on 731.2, and was updated by adding six Vitel Hydra II soil probes, for a total of 9.

This program has a normal sensor update rate of 10 minutes, and produces one daily data report to final logging storage.

Sensor Configuration

This version expects the following sensor configuration. Note that the soil probes have been organized into 3 groups. Each group contains a 2", 8" and 20" probe. Only the sensor IDs differentiates the three groups. Group 1 consists of probe IDs 1,2 and 3. Group 2 consists of probe IDS 4,5 and 6, and Group 3 consists of probe IDs 7,8 and 9. **Probes must be connected per the table below for the soil data o be properly collected.**

SENSOR	INPUT	EXITATION	XTROL	SENSOR MODEL
Snow Depth	DIFF1	12V	C1	Judd Snow Depth sensor
Soil Group 1				
Soil 2" probe SDI-12 ID 1	C3	SW12V		Vitel Hydra II SDI-12
Soil 8" probe SDI-12 ID 2	C3	SW12V		Vitel Hydra II SDI-12
Soil 20" probe SDI-12 ID 3	C3	SW12V		Vitel Hydra II SDI-12
Soil Group 2				
Soil 2" probe SDI-12 ID 4	C4	SW12V		Vitel Hydra II SDI-12
Soil 8" probe SDI-12 ID 5	C4	SW12V		Vitel Hydra II SDI-12
Soil 20" probe SDI-12 ID 6	C4	SW12V		Vitel Hydra II SDI-12
Soil Group 3				
Soil 2" probe SDI-12 ID 7	C4	SW12V		Vitel Hydra II SDI-12
Soil 8" probe SDI-12 ID 8	C4	SW12V		Vitel Hydra II SDI-12
Soil 20" probe SDI-12 ID 9	C4	SW12V		Vitel Hydra II SDI-12

CONTROL	FUNCTION
C1	Judd Snow Depth control
C2	SW12V
C3	SDI-12 Soil Probes, Group 1
C4	SDI-12 Soil Probes, Groups 2 and 3

Data Reports

Daily logging report

Field Parameter	Units	Comment
1. Storage Area	1	This parameter is not useful to us
2. Year	YYYY	The four digit year
3. Julian Day	JJJ	Julian day of the year
4. Time of day	HHMM	
5. Site ID		A numeric ID assigned by operator to this site
6. ProgID		131.0 for this program version
7. V_battery	Volts	Midnight sample
8. SnHeight	-inches	Midnight sample height of the snow sensor above the snow pack
9. SnDepAvg	inches	2300 hour average depth of the snow pack
10. Sn_depth	inches	Midnight sample depth of the snow pack
11. SnowDOff	inches	The offset applied by the operator to snowheight to derive snow depth
Soils Group 1		
12. Soil Moisture, 2"	percent	Midnight sample (S1PM)
13. Soil Temp, 2"	deg F	Midnight sample (S1degF)
14. Soil Moisture, 8"	percent	Midnight sample (S2PM)
15. Soil Temp, 8"	deg F	Midnight sample (S2degF)
16. Soil Moisture, 20"	percent	Midnight sample (S3PM)
17. Soil Temp, 20"	deg F	Midnight sample (S3degF)
Soils Group 2		
18. Soil Moisture, 2"	percent	Midnight sample (S4PM)
19. Soil Temp, 2"	deg F	Midnight sample (S4degF)
20. Soil Moisture, 8"	percent	Midnight sample (S5PM)
21. Soil Temp, 8"	deg F	Midnight sample (S5degF)
22. Soil Moisture, 20"	percent	Midnight sample (S6PM)
23. Soil Temp, 20"	deg F	Midnight sample (S6degF)
Soils Group 3		
24. Soil Moisture, 2"	percent	Midnight sample (S7PM)
25. Soil Temp, 2"	deg F	Midnight sample (S7degF)
26. Soil Moisture, 8"	percent	Midnight sample (S8PM)
27. Soil Temp, 8"	deg F	Midnight sample (S8degF)
28. Soil Moisture, 20"	percent	Midnight sample (S9PM)
29. Soil Temp, 20"	deg F	Midnight sample (S9degF)

Special Input Locations

Label	Functionality
SiteID	Numeric ID to identify the particular site
ProgID	Numeric ID of this program (131.0)
SnoDoff	Snow depth offset

Understanding Vitel Hydra II Soil Probes

This program incorporates **nine** Vitel Hydra II, SDI-12 soil probes. The Hydra II probes communicate with the CR10X data logger using the SDI-12 universal serial data interface bus. In this program, the SDI-12 bus is implemented using the CR10X's C3 control port for Group 1 probes, and C4 for Groups 2 and 3. (**See Sensor Configuration section above**) The CR10X can interrogate up to 10 SDI-12 sensors with a single control port, however this program, for wiring convenience expects just three soil sensors connected to C3, and the remaining 6 soils sensors connected to C4. All sensors connect directly to the control ports, and assume the role of a polled responder. When the CR10X needs data from a specific sensor, it sends a data request, addressing a single SDI-12 ID, over the bus (C3 or C4). Only the addressed (polled) sensor responds with the requested data.

This program assumes the soil probe installed 2” below the soil surface is sensor ID 1, while the probe installed 8” below the soil surface is sensor ID 2, and the probe installed at 20” below the soil surface is sensor ID 3. (**See Sensor Configuration section above**)

The Hydra II probe calculates soil parameters internally, and returns engineering units, or raw sensor voltages, on demand. This program utilizes Hydra II calculated values of soil temperature and soil moisture. Soil temperature is delivered in degrees Fahrenheit, and soil moisture is delivered as water, percent of volume.

Setting the Site ID Variable

This program saves an Input Storage Location variable called **SiteID** in the data summaries to help eliminate the possibility of confusing data records among the various data sites. To adjust the SiteID, simply **right click** then edit the location on the Numeric Display. The new SiteID will then be included in all subsequent data summaries.

Setting the Snow Depth Offset Variable

The Judd snow depth sensor actually reports the distance between itself and the ground or the top surface of the snow pack. This program allows the technician to apply an offset which will convert the distance reported to actual snow depth. The snow distance (Sn_height) is made negative, then the offset (SnowDOff) is added to derive the actual snow depth. To adjust the snow depth offset simply **right click**, then edit the Input Storage Location variable named **SnowDOff**. If the snow depth sensor is sitting above bare ground, the value of SnowDOff should be set to the distance (Sn_height) reported by the sensor. **Caution**: The technician should record the height of the snow depth sensor above bare ground in case the CR10X program needs to be reloaded during the snow season.

Increasing the Sensor Update Rate

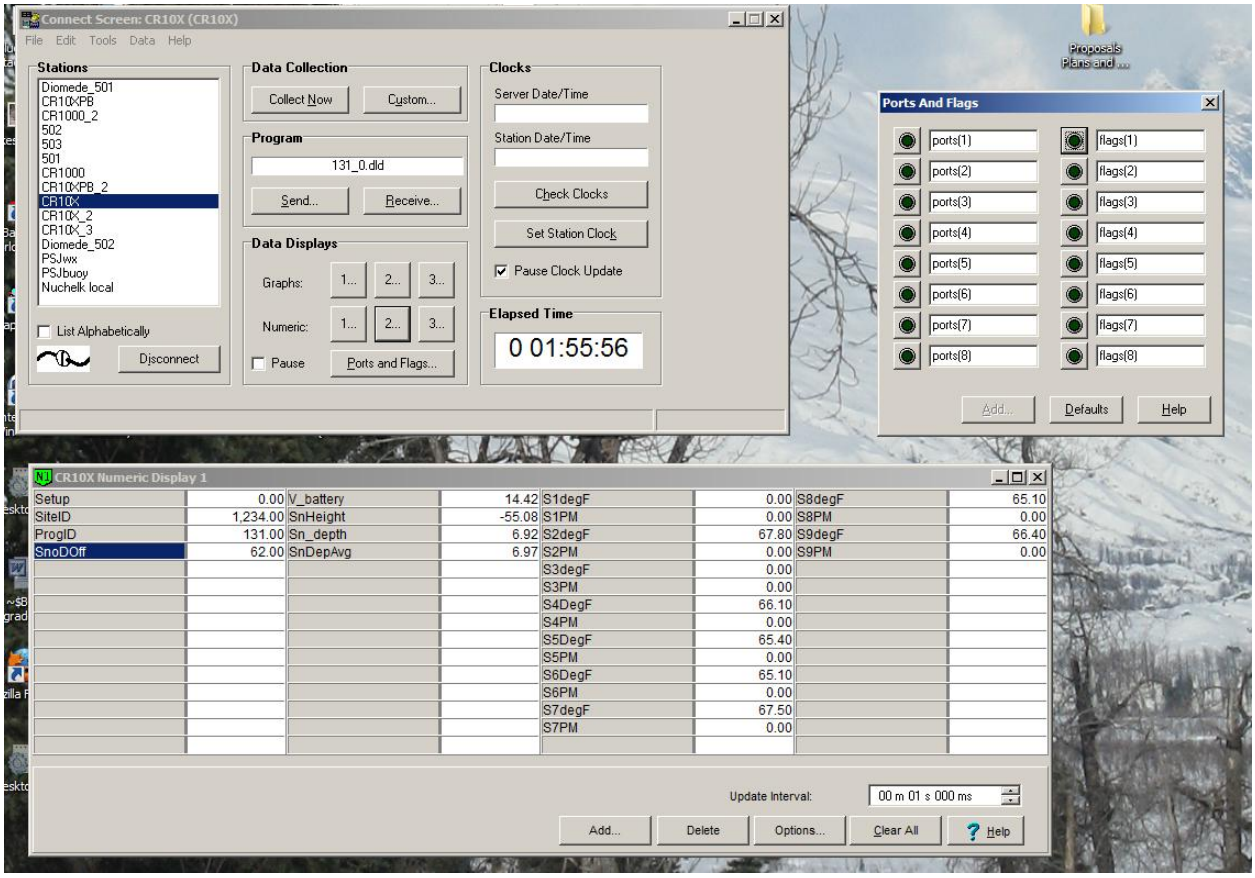
The normal sensor update rate for this program is one update every five minutes. This update rate is good for the site’s power budget, but is cumbersome when testing sensor operation. The sensor update rate may be temporarily increased by the technician to a rate of one update every ten seconds. There is no hazard in increasing the update rate, as it will automatically reset to the normal rate at the end of the hour. To increase the update rate, click the **Ports/Flags button** on the Numeric Display tab, then click the **Flag#1 button** on the Ports/Flags window.

Sensor Sanity Check

The following Input Storage Location variables represent what should be reasonable sensor values. The technician should verify that these sensor values make sense before departing the site.

V_battery	The site's 12V battery supply
SnHeight	The distance from the snow depth sensor to ground or snow pack.
SnDepAvg	The 2300 hour average snow depth
Sn_depth	The final product – should be actual snow depth.
----- Soils Group 1 -----	
S1degC	The current 2" soil temperature in deg C
S1degF	The current 2" soil temperature in deg F
S1PM	The current 2" soil moisture in percent volume
S1Sal	The current 2" soil salinity
S1Cond	The current 2" soil conductivity
S2degC	The current 8" soil temperature in deg C
S2degF	The current 8" soil temperature in deg F
S2PM	The current 8" soil moisture in percent volume
S2Sal	The current 8" soil salinity
S2Cond	The current 20" soil conductivity
S3degC	The current 20" soil temperature in deg C
S3degF	The current 20" soil temperature in deg F
S3PM	The current 20" soil moisture in percent volume
S3Sal	The current 20" soil salinity
S3Cond	The current 20" soil conductivity
----- Soils Group 2 -----	
S4degC	The current 2" soil temperature in deg C
S4degF	The current 2" soil temperature in deg F
S4PM	The current 2" soil moisture in percent volume
S4Sal	The current 2" soil salinity
S4Cond	The current 2" soil conductivity
S5degC	The current 8" soil temperature in deg C
S5degF	The current 8" soil temperature in deg F
S5PM	The current 8" soil moisture in percent volume
S5Sal	The current 8" soil salinity
S5Cond	The current 20" soil conductivity
S6degC	The current 20" soil temperature in deg C
S6degF	The current 20" soil temperature in deg F
S6PM	The current 20" soil moisture in percent volume
S6Sal	The current 20" soil salinity
S6Cond	The current 20" soil conductivity
----- Soils Group 3 -----	
S7degC	The current 2" soil temperature in deg C
S7degF	The current 2" soil temperature in deg F
S7PM	The current 2" soil moisture in percent volume
S7Sal	The current 2" soil salinity
S7Cond	The current 2" soil conductivity
S8degC	The current 8" soil temperature in deg C
S8degF	The current 8" soil temperature in deg F
S8PM	The current 8" soil moisture in percent volume
S8Sal	The current 8" soil salinity
S8Cond	The current 20" soil conductivity
S9degC	The current 20" soil temperature in deg C
S9degF	The current 20" soil temperature in deg F
S9PM	The current 20" soil moisture in percent volume
S9Sal	The current 20" soil salinity
S9Cond	The current 20" soil conductivity

Important: If these or other Input Storage Location variables are not displayed on the Numeric Display tab, they may be added to the Numeric display by clicking the **Add** button, then dragging them from the **Inloc List** window to the Numeric Display.



Utilizing Special Operator Features

Rapid Sensor Update Feature

This program normally reads its sensors once every five minutes. When installing new sensors, or troubleshooting sensor related problems, it is advantageous to have the program read the sensors more frequently. From within PC208, the technician may temporarily increase the sensor update rate to once very ten seconds. This is accomplished by opening the **PORTS/FLAGS** window, then clicking the button named **F1.** While **F1** is set (darkened), the program will complete a sensor update once every ten seconds. There is no power budget risk in enabling this feature, as the update rate returns five minutes at the end of the hour or when a data message is generated by the CR10X.