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**CR10X Data Collection Program
Version 101.22
7/29/2007**

StationType	Sensor Update rate	Reports Produced
Non-telemetry	5 Minutes	Daily logging

CR10X data collection program version 101.22 is a non-telemetry snow course data collection system. This version supercedes all 101 series programs.

Revision History

Revision	Date	Functional Revisions
101.21	9/10/2002	Base program
101.22	7/29/2007	Increase Snow Depth warm up delay from 60 to 80 ms

This program has a normal sensor update rate of 5 minutes, and produces a daily summary report to final logging storage.

This program has several special features which will allow it to be used in multiple data sites without revision. These features, however, require some attention and manipulation by the installation and service technicians.

❑ SnowWater and StoragePrecip sensors are selectable by setting a pair of input location variables when setting up the site. See **Setting Snow and Precip Parameters**.
❑ An offset may be applied to the snow depth sensor to convert the height reported by the sensor to a snow depth value.
❑ A numeric value may entered which will serve as a site identifier. This will help to ensure that data records are never transposed among the various sites.
❑ Update rate may be temporarily increased to one every ten seconds to facilitate testing and verification of data sensors.

Site and sensor variables are initialized to default values when the program first loaded into the CR10X, and whenever a new program (DLD file) is sent to the CR10X The technician should always verify that the variables are acceptable before leaving the site.

All variables are simply CR10X Input locations, which may be modified by right clicking, then editing each variable on the NUMERIC DISPLAY tab of PC208W.

Sensor Configuration

This version expects the following sensor configuration:

SENSOR	INPUT	EXCITATION	XTRL	SENSOR MODEL
Snow Water	SE1	SW12V		
Storage Precip	SE2	SW12V		
Air Temperature	SE3	E1		YSI 44211
Snow Depth	DIFF3	12V	C2	Judd Snow Depth sensor
Solar Radiation	DIFF4			LI 200X

CONTROL	FUNCTION
C2	Judd Snow Depth control
C1	SW12V

Data Reports

Daily logging report

field	Parameter	Units	Comment
1	Storage Area	n/a	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	Program ID		101.20 for this program version
7	Battery		Midnite sample
8	Snow Water	inches	Last hour average snow water
9	SnowMult		Snow Water multiplier – default is 100" Druck (0.0408)
10	SnowOff		Snow Water offset – default is 100" Druck (-2.0408)
11	Storage Precip	inches	Last hour average storage precipitation
12	PrecMult		Storage Precip multiplier – default is 100" Druck (0.0408)
13	PrecOff		Storage Precip offset – default is 100" Druck (-2.0408)
12	CurrentAirTemp	deg F	YSI44211 extended range midnite sample
13	MaxAirTemp	deg F	Daily Maximum
14	MinAirTemp	deg F	Daily Minimum
15	AvgAirTemp	deg F	Daily Average
16	SnowDepth	inches	Last hour average depth of the snow pack
17	SnowHeight	-inches	Midnite sample height of the snow sensor above the ground or snow pack
18	SnowDOff	inches	The offset applied by the operator to snowheight to derive snow depth
19	SolRAdAvg	w/M2	Daily Average Solar Radiation

Setting Snow and Precip Parameters

The Snow and Precip transducer sensors may be one of several types. When installing a new sensor, first verify that the sensor you are installing is compatible with the existing wiring scheme in use at the site. A couple of things to consider:

- What is the sensor's output? If the sensor's output is 0-5VDC, then a 2:1 voltage divider should be used, or the multiplier and offset should be calculated accordingly. Better resolution may be obtained if the sensor can be used without a voltage divider. If the sensor's output is 4-20ma, then a termination resistor should be used at the CR10X.
- What is the sensor's excitation requirement? If the sensor requires an excitation voltage other than 12VDC or 0-2500mv, some voltage conversion method should be used.

When changing a sensor, you must edit two input locations. For snow water, the locations are named SnowMult and SnowOff. For storage precip, the locations are named PrecMult and PrecOff. Edit the locations according to this table:

Sensor	Mult	Offset	Comment
0-50" Sensotech or Halpern	0.02	0.0	
0-100" Sensotech or Halpern	0.04	0.0	
0-200" Sensotech or Halpern	0.08	0.0	
100" Druck PMP 317 used with 2:1 divider	0.04	-1.0	Range is 0-100'
100" Druck PMP 317 used w/o 2:1 divider	0.02	-1.0	Range is 0-50"
200" Druck PMP 317 used with 2:1 divider	0.08	-2.0	Range is 0-200"
200" Druck PMP 317 used w/o 2:1 divider	0.04	-2.0	Range is 0-100"
0-69" Druck	0.0308	-7.7	

Note: The Druck PMP317 transducers are calibrated by NWCC personnel. The table above assumes 0" equals 50 millivolts, and full scale equals 5050 millivolts. If this is not the case for your transducer, you may have to calculate the multiplier and offset. Use the following general formulae:

> $Mult = fs / 5000$
> > Where fs is full scale value in inches ie: 100", 200"

> $Offset = 50 * mult$

If these variables are set correctly, the Numeric Display tab should display the actual head on the transducers at the following Input Storage Locations:
> **SnowWater** for the snow water sensor
> **StgPrecip** for the storage precip sensor

Note: If either the snow or precipitation sensor is not used, set its multiplier to 0, and its offset to –99.9. This will force the CR10X to record –99.9 values for the non-existent sensor.

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 makes sense before departing the site.

V_battery	The site's 12V battery supply
SnowWater	The final product of the snow water sensor and its multiplier (SnowMult)
StgPrecip	The final product of the precip sensor an its multiplier (PrecMult)
Airtemp	The current air temperature
Sn_height	The distance from the snow depth sensor to ground or snow pack.
Sn_Depth	The final product – should be actual snow depth.
SolRad	The current Solar radiation value.

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.