Standard Operating Procedure (SOP) 9: Annual Site Visit, Version 2.0

Weather and Climate Monitoring Protocol

Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks

Change history

Previous Version #	Revision Date	Revised By	Changes	Justification	New Version #
1.00 (SOP 12)	12/19/2006	P.Sousanes	Added reference to cold weather usage	Incorporated peer review comments	1.01
1.00 (SOP 13)	12/20/2006	P. Sousanes	Added reference to temperature limitations and changed title to match narrative	Incorporated comments from peer review and made edits	1.01
1.00 (SOP 15)	12/20/2006	P. Sousanes	Added details to all items. Added new Therm-X temp sensor instructions.	Incorporated peer review comments	1.01
1.00 (SOP 16)	12/20/2006	P. Sousanes	Calculator was listed twice. Explained use of silicone	Incorporated peer review comments	1.01
1.00 (SOP 17)	12/20/2006	P. Sousanes	Adopted SOP created for NPS I&M by WRCC	Consistency among networks for photographic documentation	1.01
1.01 (SOP 12, 13, 15, 16, and 17)	March 2017	P. Sousanes K. Hill, M. Bower, W. Johnson	Updated data download instructions, site checklist, and photo documentation.	New datalogger software; changes in documentation of work done during site visit, and one additional photo angle added to photo documentation. Combined five field SOPs to one single SOP.	2.0

Please cite this Standard Operating Procedure as:

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Overview

This SOP includes all the instructions you need to conduct an annual site visit at a weather station. At this point all of the flight and field logistics have been planned (SOP 1), the compliance for the season is complete (SOP 2), the maintenance plan for the summer has been created (SOP 1), all of the necessary trainings for field work and aviation are finished, and all necessary safety plans are complete and filed (SOP3).

Field preparations

Prepare site checklists

Maintenance logs and sensor metadata are updated annually and stored on individual network drives. Annual operations reports are compiled annually and submitted as Natural Resource Science and Stewardship (NRSS) reports. Use the annual maintenance plan (Table SOP 9-1; SOP 4 for calibration schedule) and the previous year's operations report (Table SOP 9-2) and/or site visit worksheet (Appendix A) to create a new site visit worksheet for the annual visit to each station. Information will include: site name, telemetry information, list of sensors that need to be swapped, any field calibrations that are due, and any outstanding maintenance that may need to be accomplished (See Appendix A for example of a site checklist).

Table SOP 9-1. Excerpt from an annual maintenance plan.

Year: 2014		Tipping	AT/RH	AT/RH	Secondary	Solar	Snow	GOES	
Station Name	**Wind**	**Bucket**	**Sensor**	**Cable**	**AT**	**Rad.**	**Depth**	**TX**	**Datalogger**
Chititu			X	X					
Chicken Creek	X	X	X	X	X	X	X		
Tebay			X	X					
Tana Knob			X	X					

Table SOP9-2. Excerpt of metadata compiled in an annual operations report.

Station Name	Item	Model	Start Date	Serial # / Description	Stop Date
Mt. Noak	Antenna	25316 YAGI	7/11/2011	Old style; fixed elements	Active
	Air Temp	ThermX	7/11/2011	Lot #30774	Active
	AT-RH	HMP-45C	7/11/2011	F1234592	7/14/2012
	AT-RH	HMP-45C	7/14/2012	A3416782	Active
	Battery	100 AH (x2)	7/11/2011		Active

Before heading to the field, make sure to check the real-time data stream for each site you plan on visiting to determine if there are any sensors that are not transmitting; include this information and any other relevant information about the site on the site visit worksheet. You can often tell quite a bit about the condition of a station before you arrive by looking at the data. This will help ensure you

have enough back-up equipment to fix any problems you might encounter in the field. Print out a copy of each site checklist to bring to the field.

Websites for viewing real-time data:

1) Wildland Fire Information Management Site (WFMI [https://wfmi.nifc.gov/cgi/WfmiHome.cgi]): Weather>SelectView>Station. A user account is required to access WFMI (see SOP 7).
2) Mesowest Region:Alaska>Network:RAWS>Station

Gather Field Gear

Bring everything on the equipment checklists from SOP 8. This list includes a full suite of back-up sensors and equipment to fix or replace most items on a station. These stations are remote and costly to access so proper planning and packing is essential.

Determine whether the operating system needs updating on stations

Replacing a datalogger's operating system (OS) must be done periodically in order to correct significant errors in its operation as well as to add new functionality and device support. But there is some risk associated with upgrades. Replacing an operating system erases all existing content in the equipment: current data must be securely backed up with certainty to another device before attempting installation of a new OS. Also, occasionally new errors get introduced into new versions of OSs that might impact the data collection. While problems are very unlikely, the reality that we may not be able to remedy station operation issues until the next field season makes the risk of station impairment more problematic.

Consider whether an operating system upgrade is worth doing. First, review the prior season's site visit worksheets to determine which operating system version is running each station. Then check the Campbell Scientifc, Inc. operating system web page to see if any newer versions are available (https://www.campbellsci.com/revisions?dl=103). If there are, study the documentation for the latest versions to determine if a critical correction has been implemented, new desirable functionality has been added, or additional instruments of interest are supported. Finally, evaluate whether the features of the new software are worth the slight risk of compromising remote stations. It is sometimes advantageous to upgrade to a version one short of the latest: the latest may have an issue that would impair station operations which has not yet been reported and corrected. The list of specific corrections to the latest version will shed light on what errors became known in its immediate predecessor.

If it is determined that an OS upgrade is warranted, it is best practice to upgrade all stations to the same level. Maintaining multiple versions of operating systems can lead to confusion and complexity when troubleshooting a station's faults. The OS version number before and after a site visit is recorded on the worksheet to eliminate potential issues with version numbering.

New versions are available from the Campbell download page (https://www.campbellsci.com/downloads). If a new operating system is to be employed this season,

be sure to download it to the field laptops. The upgrade process and new system operation should be tested on a local station before attempting to do it in the field.

Step-by-step instructions for an annual maintenance trip:

1. Inspect station on arrival. Document and photograph any visible physical problems.
2. Fill in site name, date, time, and names of site operators on the site worksheet.
3. Connect the field laptop to the datalogger using LoggerNet (Appendix B).
4. View the station data and record the current values on the site visit worksheet prior to starting any field maintenance (refer to SOP 5 for Setting up the Field Laptop; Appendix B).
5. Record the Station Date/Time under the Clocks tab on the Connect Screen. If datalogger time is off, reset it with the laptop time (*but always* AKDT), and record the discrepancy on the site visit worksheet in the comment section.
6. Download data from datalogger (Appendix B for a field laptop or Appendix C for the Archer handheld field computer). Retrieve the current program and save to the laptop (as a precautionary backup in case the final installed version of the program was not saved the previous year).
7. Ensure that tripod/tower is level and plumb.

8. Swap the air temperature/ relative humidity (AT/RH) sensor with a calibrated sensor, or replace RH chip, as recommended by manufacturer. Record the serial numbers of both sensors in the appropriate column on the site visit worksheet.
    a. For an HMP45 model sensor, loosen the plastic fitting on bottom of radiation shield, pull out the sensor, pop off the sensor head, and replace with new sensor head. Mark the old sensor head with a piece of black electrical tape to easily identify it as a sensor that needs to be calibrated
    b. For an HMP60 model sensor, loosen the clamp on bottom of radiation shield, pull out sensor, unscrew cap, remove RH chip and replace with new one.
    c. Other models of AT/RH sensors may vary slightly in design.
9. Swap other sensors if necessary. Record serial numbers for each sensor swapped.
10. If station has an SR50a snow depth sensor, change desiccant in sensor head.
    a. Follow instructions in sensor manual; do not attempt this in the field if it is raining.
11. Check sensor leads for damage.
12. Check to make sure the pyranometer is level and clean if necessary.
13. Check tipping bucket for debris and level tipping bucket.
14. Record the current values of Rain_in and RainCumulative_in (or RNIN_Cumul and RNIN_Tot) from the public table on the site visit worksheet. Test the tipping bucket by manually tipping the mechanism 10 times. Look at the data to see if 0.10 inches were recorded. Go back in program and reset both rain parameters to the readings recorded before the test (i.e. subtract the simulated precipitation).
15. Record the snow sensor height in inches from the public table onto the site visit worksheet.
16. Clean the gill plate radiation shield (s).
17. Clean the enclosure.
18. Tighten guy wires.

19. Tighten bolts.
20. Check the battery. Clean the battery terminals if necessary.
21. Brush around the site, especially under snow depth sensor.
22. Check alignment of GOES Yagi antenna.
23. Check to make sure the Yagi antenna elements are tight.
24. Clean glass on solar panel
25. Record the final sensor heights on the worksheet.
26. Update the operating system on the datalogger (if necessary) and load a new program (if necessary) (see procedures in Appendix SOP 9–B).
27. Re-enter the cumulative rain measurement and the snow depth sensor height (from the site visit worksheet) in the public table.
28. Retrieve the final version of the program that was uploaded after all field changes were implemented (so do this right before you log out). This is an annual deliverable used to track QA/QC, versioning issues, etc. (SOP 10; Deliverable WC_D).
29. Before you leave, check the data again to make sure all the values are as expected.
30. Take good field notes – record everything that was done. Use the comment field to provide details.
31. Replace desiccant in enclosure after all work inside the enclosure is complete.
32. Take photos of site following the steps in Appendix D.
33. If the site has a phenology camera see maintenance instructions and site visit worksheet example in Appendix E.

Review of sensor/equipment replacement or calibration schedule

Every year:

- Calibrate the AT/RH sensor (HMP45, HMP 155 or current model) or replace RH chip (HMP60)
- Field check tipping bucket (tipping mechanism test)

Every two years:

- Calibrate the pyranometer (LI200X or current model).

Every three years:

- Replace primary AT (109)
- Replace anemometer bearings and wind vane potentiometer (RM Young 01503 or current model)
- Replace snow depth sensor

Every five years:

- Upgrade and recertify datalogger
- Calibrate tipping bucket (factory calibration).

Every ten years

- Upgrade satellite transmitter (or as necessary)
- Replace primary batteries (or as necessary)
- Replace enclosure (or as necessary)

After the field season:

Transfer all field data and photos to the network drive. Follow these steps:

Site visit worksheets

Upon returning to the office, copy all site visit worksheets from the field laptop to the **Site Visit Worksheet** folder on the network drive (or appropriate destination by network). If paper copies were used in the field then enter the data into the Excel spreadsheet template. Follow the steps outlined in SOP 10 (Processing the site visit worksheets deliverable WC_C) to compile all of the site visit spreadsheets into one zipped file for dissemination and archiving. Use the naming convention for each site. For example: WC_C_2015_SMPA2.XLSX. Once the season is over, all stations are zipped into a single file representing the year, for example: WC_C_2015.ZIP.

Use the site visit worksheets to update the maintenance logs on the network drive.

Photos

Upon returning to the office, transfer the 17 photos from each site to the station's **Photo** folder on the network drive. Verify photos have been transferred. Keep photos on the camera card until backup of the network drive has occurred. Use the naming convention in Appendix E to name each of the photos with the site name and location. One zip file is maintained for each station's photo documentation for each year. Follow the steps outlined in SOP 10 (Processing the site photo sets deliverable WC_E). For example, WC_E_GGLA2_2015_T_NE.JPG.

Data

Copy all data (site name_hourly.dat files) from field laptop to the station's **Data** folder on the network drive. Verify data transfer. Keep data files on the field laptop until backup of the network drive has occurred. The data files on the laptop are named by site. Once back in the office follow the steps outlined in SOP 10 (Processing the station downloads deliverable WC_F) to rename the files to the standard naming convention. For example, WC_F_DENA_RUGA2_201806151400-201905300900.DAT.

Update the WFMI narrative

Once back in the office, use the site visit worksheets to update each station's narrative in WFMI (SOP 7).

Appendix SOP 9 – A. Example Site Visit Worksheet

CAKN Weather & Climate Monitoring			**CAKN Program Contact:**
Site Visit Worksheet	*Example Worksheet for SOP 9, Version 2017*		Pam Sousanes/Ken Hill
Version: 8 March 2017			phone: (907) 455-0677/(907)-455-0678
			email: pam_sousanes@nps.gov/kenneth_hill@nps.gov
Site name	Gates Glacier	**DCS - Sat. TX Check**	**RAWS HelpDesk:**
Date of this visit	6/29/2016	phone: (757) 824-7450	phone: (208) 387-5475
Operators	P. Sousanes and K. Hill	24/7 technical support	Hours: M-F, 6 AM-2:30 PM AST

Pre-Field Information

(Look up the station: www.nifc.blm.gov-->Login-->'Weather' -->'Select Station')

GOES Information:		Sensors	Swap? (Y/N)	Recent error events (list)?
Latitude	61.602889	Temperature	(add 109)	
Longitude	-143.013211	mp/Relative Humidity	Y (HMP45)	
NESDIS ID	39608018	Solar Radiation	N	
Tx Time (mm:ss)	0:33:50	Wind Speed/Dir	N	
Tx Channel	172	Snow Depth	N	
Antenna Azimuth (Deg Mag)	171	Soil Temp 1	N	
Antenna Elev. (Deg.)	20	Soil Temp 2	N	
Currently activated?	Y	Soil Temp 3	N	
Currently transmitting?	Y	Precipitation	N	
NWS Site ID	GGLA2	Datalogger	N	
		Transmitter	N	
		Battery	N	
		Fence	N/A	

Record Site Conditions

Time visit begins:	1430	Time visit ends:	1600
Station accessible? (Y/N)	Y	If no, comment:	
Cables intact? (Y/N)	Y	If no, comment:	
Power source ok? (Y/N)	Y	If no, comment:	
Batteries ok? (Y/N)	Y	If no, comment:	

Record Station Status Table Values

(WMD: PConnectCE-->Connect Button-->Measurements Tab-->'Select 'Status' from Table Drop-Down Box)
(Laptop: Device config utility-->Select DataLogger CR1000 -->Connect Button-->Data Monitor tab-->Status table and >Public table)

	Before Maintenance:		After Maintenance:	
OSVersion	26		26	
ProgName	GatesGl_2015.CR1		GatesGl_2016.CR1	
StartTime	7/9/15 18:31		6/29/16 15:48	
12 V Battery Voltage	13.2		13.2	
Panel Temperature	16.8		17.4	
Watchdog Errors	0	Reset if >0	0	Reset if >0
Lithium Batt Volt	3.4	Replace if <2.9	3.4	Replace if <2.9
Low 12V Batt Count	0	Reset if >0	0	Reset if >0
Skipped Scan	0	Reset if >0		Reset if >0

Maintenance Checklist

		Variable Names by Network/Example		Check transmitted values:	
	Completed? (Y/N	**SEAN**	**ARCN/CAKN**	Value	OK? (Y/N)
Download Hourly Data	Y	RainCumulative_in	RNIN_Cumul	6.36	Y
RNIN before program update	6.36	Rain_in	RNIN_Total	0	Y
SR50 height before	107.5	WindSpeed_mph	WSM	2.33	Y
Upload new program	Y	indDirection_degrees	WDD	353.9	Y
Re-enter RNIN after	6.36	AirTemp_F	ATF_109	56.5	Y
Measure and re-enter SR50	106	FuelT_F	FTF	na	
Clean Rain Gage	Y	RelHumidity_pct	RHP_45	47	Y
Clean Temp Shield	Y	Battery_V	BVV	13.2	Y
Level Solar sensor	Y	Max_WindDirection	WDDP	53.9	Y
OS Version updated?	N	Max_WindSpeed_mph	WSMPH	2.4	Y
Replace Desiccant	Y	SnowDepth_in	SDI	0.7	Y
Tighten Guy Wires	Y	SolarRadiation_W	SRW	400	Y
Clean Battery Terminals	N	SoilTemp1_F	STF	70.5	Y
Clean Snow Depth Area	Y	SoilTemp2_F	STF2	61	Y
Brush Station Vicinity	NA	SoilTemp3_F	STF3	46.3	Y
Tighten elements on YAGI	Y	SoilTemp4_F	STF4	n/a	
Take Site Photos	Y	JuddHeight_in=	Const SR50_ht=	106	Y
		ATF Secondary (HMP 45)		57.2	Y

Record Sensor Configuration Changes

	Model # out	Serial# out	Model # in	Serial# in	Cable length (ft)	Height/depth (in)
Primary Air Temperature	new		109	308903-3	10	72
nperature/Relative Humididty	HMP45	X3410042	HMP45	X3410043	6	72
Solar Radiation						113
Wind Speed/Direction						125
Snow depth						106
Soil Temp 1						10 cm
Soil Temp 2						20 cm
Soil Temp 3						50 cm
Precipitation						113
Datalogger						
Transmitter						

Comments

Evidence of bear activity, scratches on battery box. No other damage.

Next visit bring 3/4" nu-rail. Check on enclosure, replace in next few years.

Phenology camera: Download photos from camera. Update camera settings: Site Name GGLA2, Still Image Settings Defaul File Name GGLA2; Banner Position Outside Top GGLA2 include SN and Temp;

Recorded GPS coordinates with Trimble

WFMI Maintenance Narrative

(Fill out prior to submission of NAMS post-trip update. Update may contain several station visits.)

6/29/2016 Annual maintenance Ken Hill and Pam Sousanes. Swapped AT-RH sensor for calibration. Added 109 sensor as primary air temperature measurement. Downloaded data and uploaded new program. Snow depth sensor height = 106 inches. Tightened guy wires and replaced desiccant. Swapped SD memory card in CC5MPX camera and updated settings.

Image identifiers of photos taken

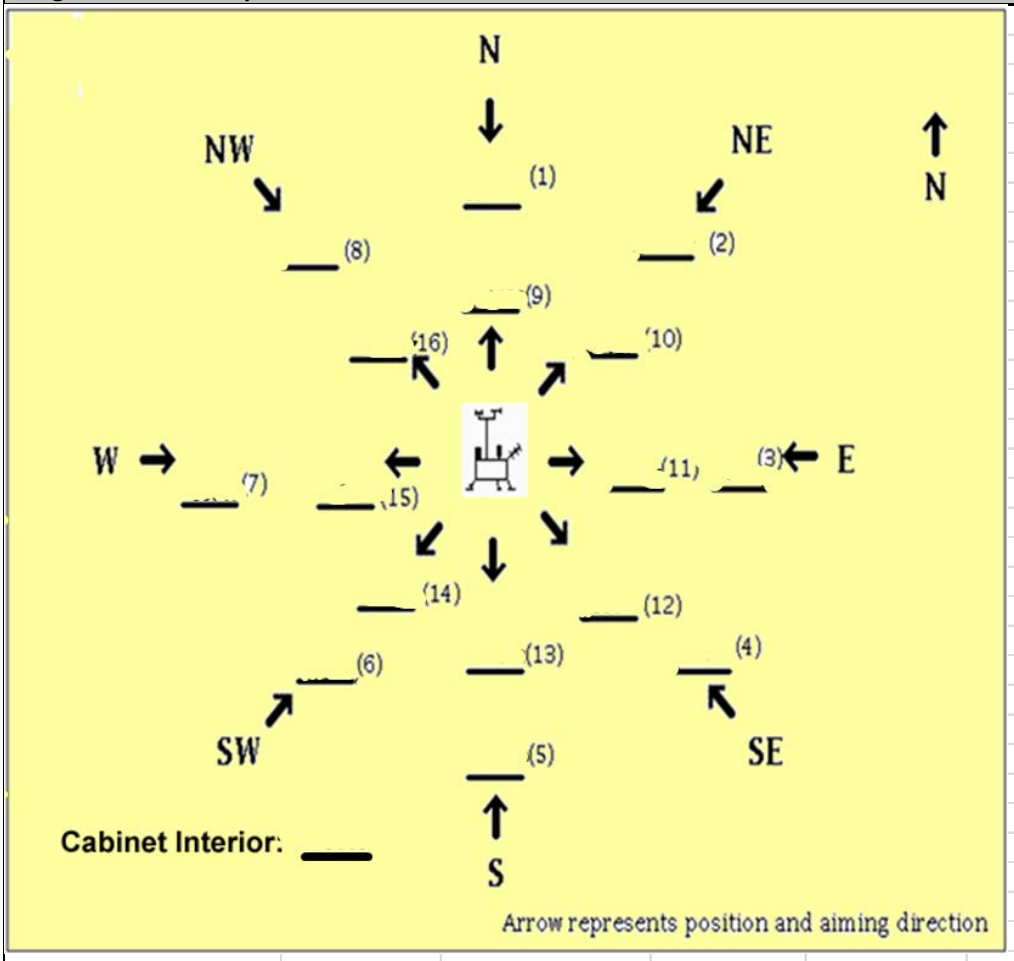


Photo Key	Direction	Image # on came	Image # Computer
1	From N towards station	535	P7280594
2	From NE towards station	536	595
3	From E towards station	537	596
4	From SE towards station	538	597
5	From S towards station	539	598
6	From SW towards station	540	599
7	From W towards station	541	600
8	From NW towards station	542	601
9	Towards N from station	543	602
10	Towards NE from station	544	603
11	Towards E from station	545	604
12	Towards SE from station	546	605
13	Towards S away from station	547	606
14	Towards SW away from station	548	607
15	Towards W away from station	549	608
16	Towards NW away from station	550	609
17	Photo of interior of enclosure	551	610

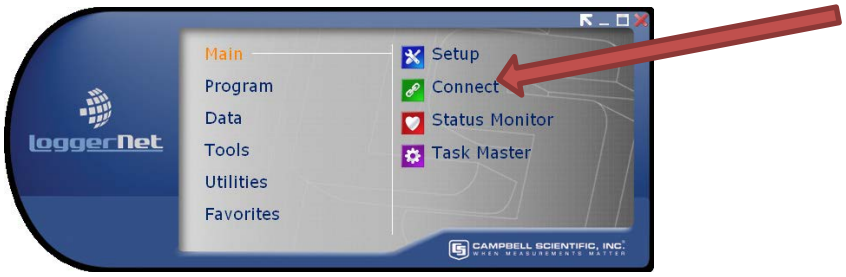
Appendix SOP 9 – B. Downloading Data with LoggerNet on Field Laptop

This appendix describes how to connect the field laptop to the CR1000 datalogger at the site in order to view the current data, check on the datalogger status, download the stored data, send new programs, and update the datalogger operating system. The following is a summary of the procedures involved in collecting data via a Windows based laptop with Campbell Scientific, Inc. LoggerNet software installed. There are many other nuances to Loggernet, for a full description of the LoggerNet software capabilities refer to SOP 5 'Field Laptop Setup' and/or the LoggerNet Instruction Manual (https://s.campbellsci.com/documents/us/manuals/loggernet.pdf). Field operators should be familiar with the software before heading to the field. The software package is likely to change in the future; this appendix will be updated accordingly.

Connecting the Field laptop to the Datalogger

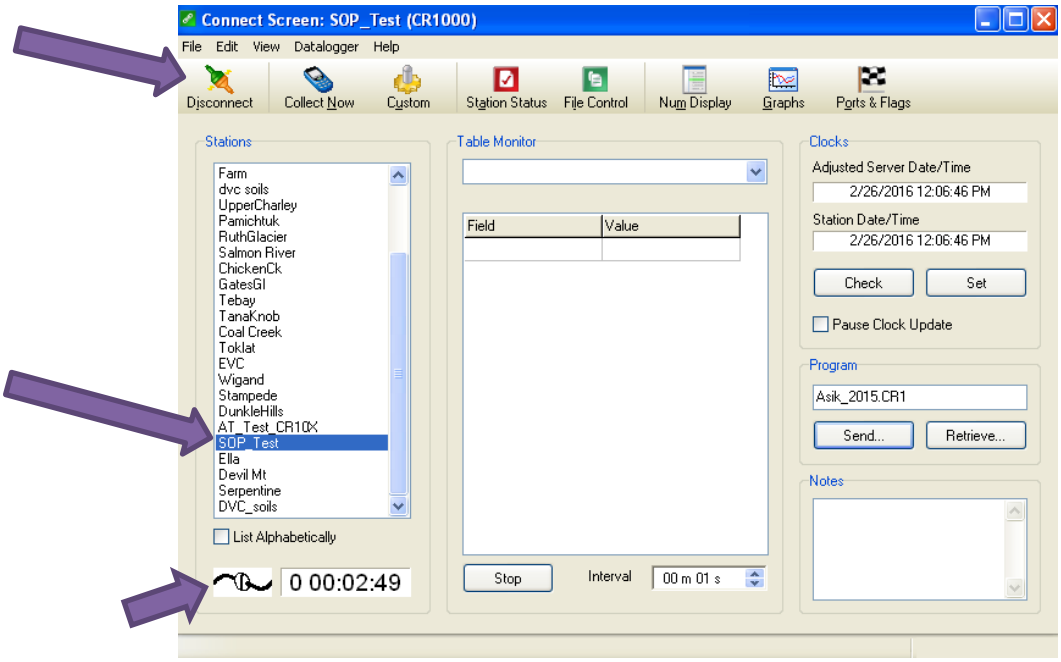
1. Connect the datalogger to the laptop using either the RS232 cable from the datalogger or the SC-USB serial cable for battery powered laptops. Use a USB/Serial port on the laptop and the CS/IO serial port on the CR1000.
2. Click on the LoggerNet shortcut icon.

3. Click the **Connect** button on the LoggerNet tool bar under the Main menu.



4. The station name should appear in the left frame. If the station is not listed, refer to SOP 5 'Field Laptop Setup'.
5. Click on the station (name) that you are currently servicing and then click **Connect** at the bottom of the screen.
6. The icon at the lower left should show that you are connected and the elapsed time indicator will start. If a connection is not made, try the following troubleshooting procedures:
    a. Confirm that the datalogger is receiving power.
    b. Confirm that the RS-232 serial/SC-USB cable is intact and connected to the CS/IO serial port on the CR1000.
    c. Confirm that all software and drivers are correctly installed.

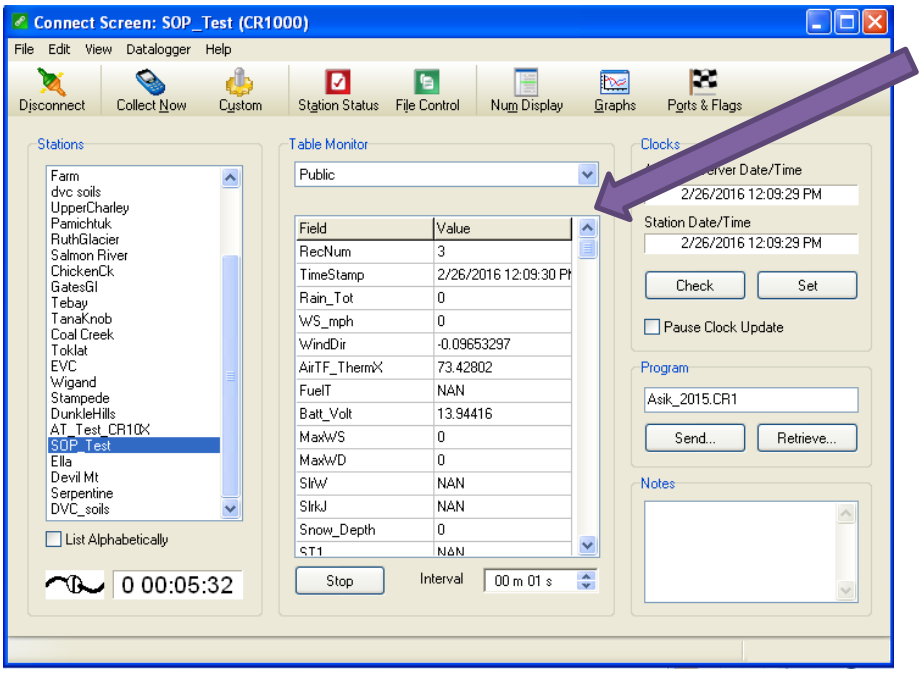
d. Confirm that the correct ComPort (COM-1 for RS-232) is being used. For troubleshooting use the Windows Device Manager (Control Panel – System – Hardware - Device Manager – Ports) to determine which port is being used by the RS232 serial/SC-USB cable.



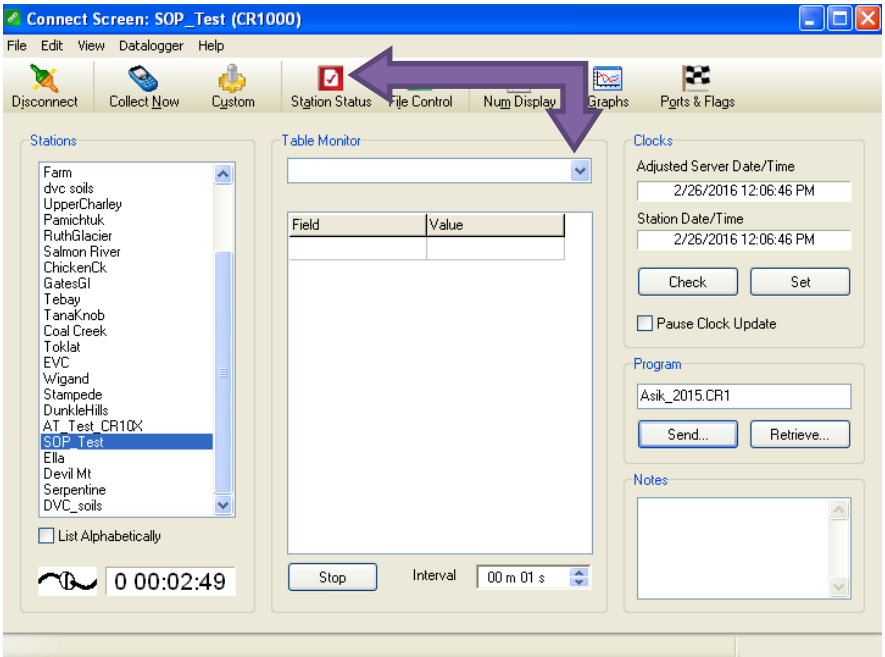
Check Datalogger Status and View Current Observations

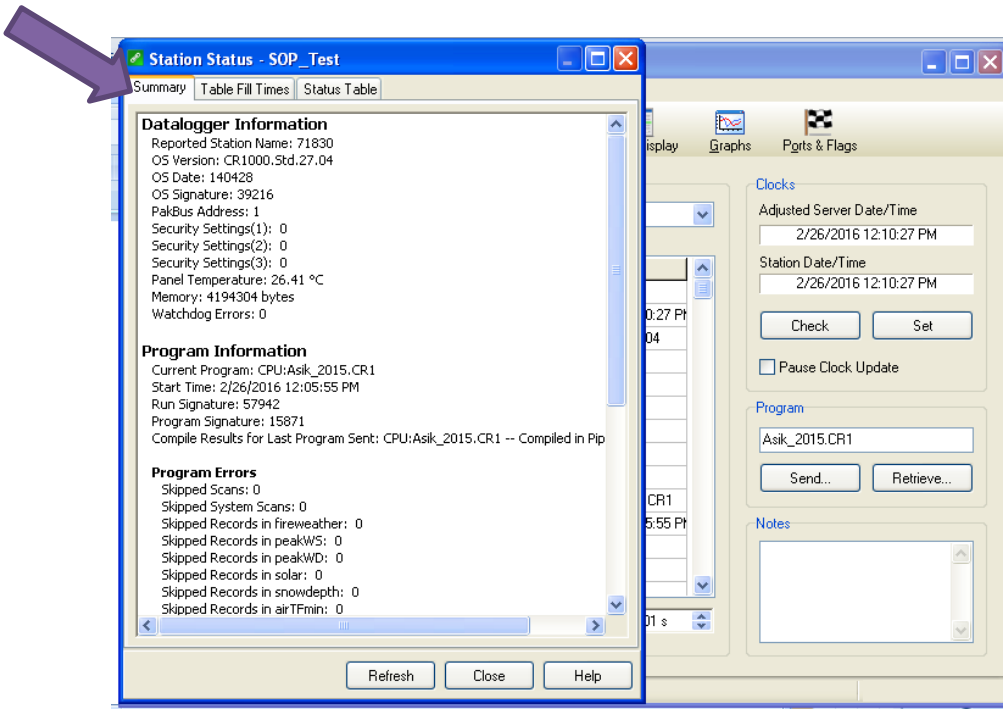
Use the Table Monitor pull down menu in the center of the Connect Screen to access the Public table to view current observations and the Status table to view information related to the datalogger condition.

Public Table: In the Table Monitor pull down, select Public. This will display the current observations for every sensor. Record these values on site worksheet prior to downloading the data.



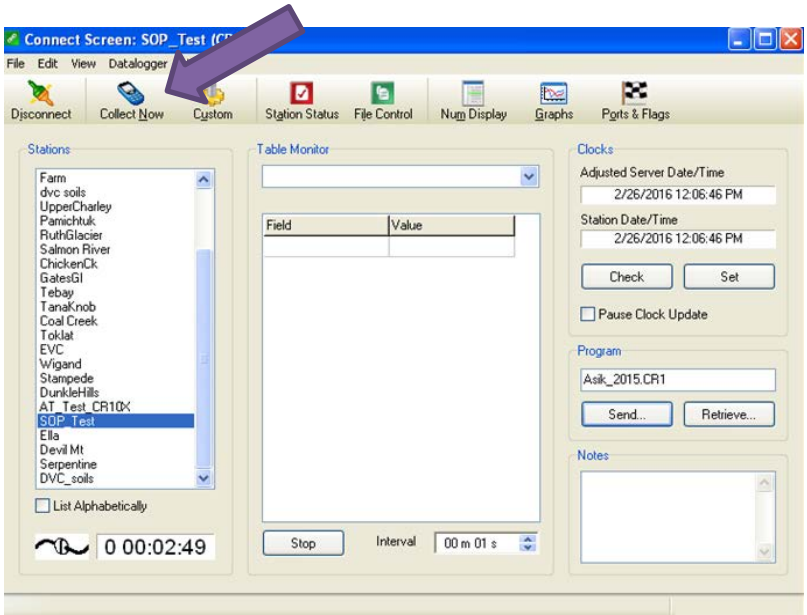
Status table: The status table contains information about the datalogger type, operating system version, program statistics, etc. You can access the tables by selecting them from the table monitoring drop down menu in the center of the Connect Screen or by selecting Datalogger/View Station Status from the top menu on the Connect screen. A window similar to the one shown below will be displayed. The Summary tab has the information that will be recorded on the site worksheet.



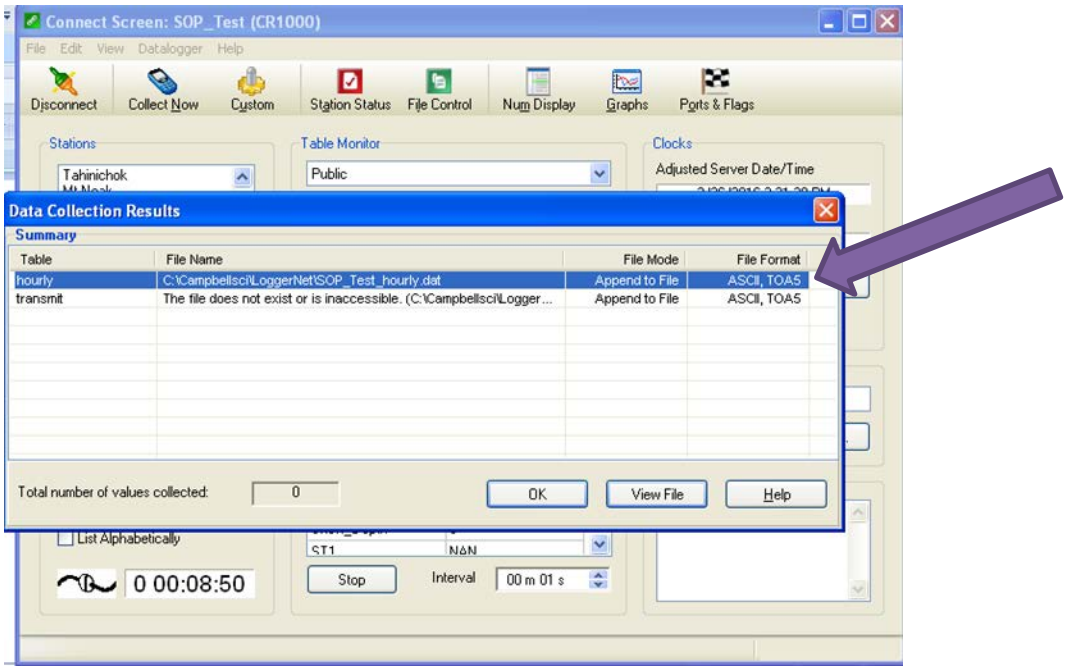


Download the Data

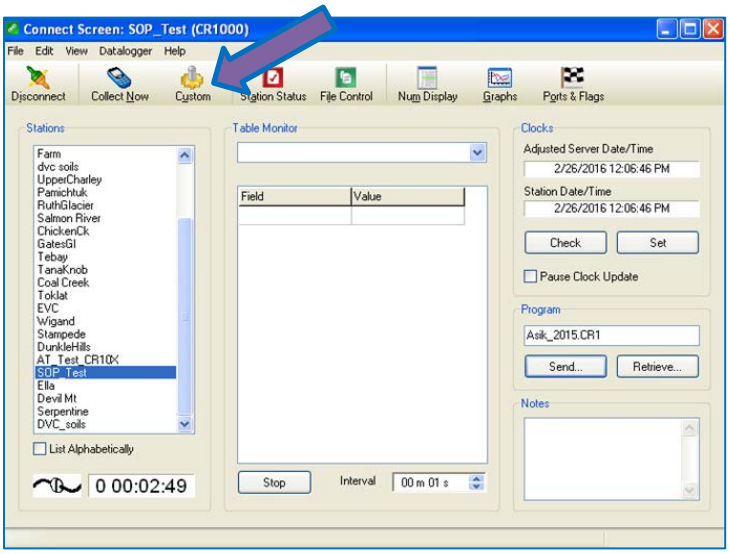
The **Collect Now** icon on the Connect screen menu will default to collect all data since the last collection for the hourly table defined in the program (see SOP #6 Datalogger Programming).



Once it has finished collecting all the files a “Data Collection Results” table will pop up. Check the file to confirm that the file was downloaded. The file name and location will be C:\ C:\Campbellsci\LoggerNet*stationname*_hourly.dat.

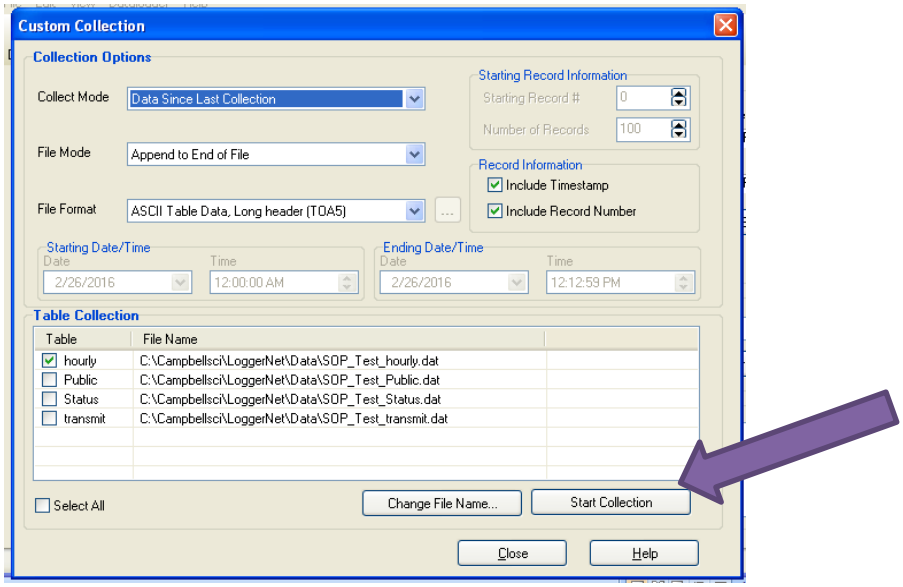


The Custom icon to the right of the Collect Now icon allows you to customize the data collection based on date, number of records, specific tables (if more than one exists), and file format, and file mode. If using the Custom icon you can select the following options to get the same file as 'collect now'.



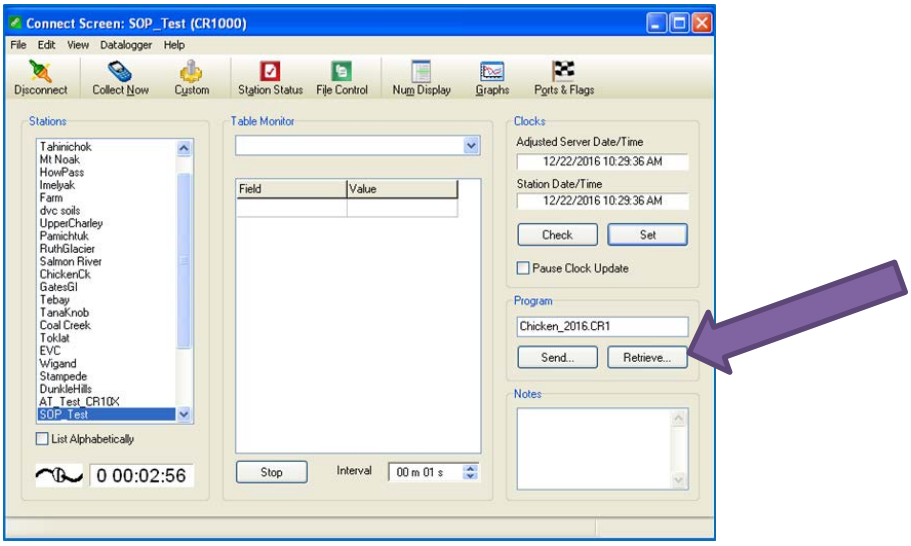
1. On the Connect screen, click **Custom**
2. Change the Collect Mode to "Data Since Last Collection".
3. File Mode should default to "Append to End of File".
4. File Format should default to "ASCII Table, Long header (TOA5)"
5. Check hourly table to download.

6. Note the file name and download location as C:\Campbellsci\LoggerNet*stationname_hourly.dat*.
7. Click on **Start Collection.** The data from the datalogger will be collected and stored in a file named *stationname*.dat in the LoggerNet file under the Campbellsci folder.

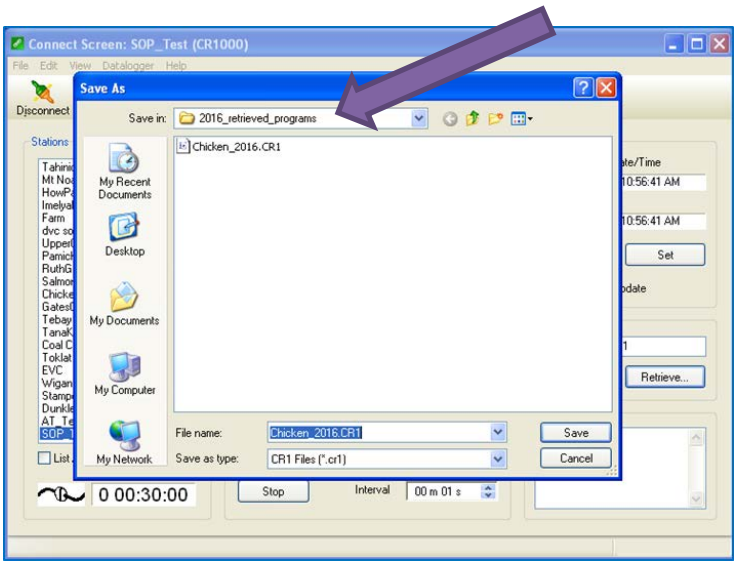


Retrieve Current Program

1. Click on the **Retrieve** button under **Program** on the **Connect** screen.



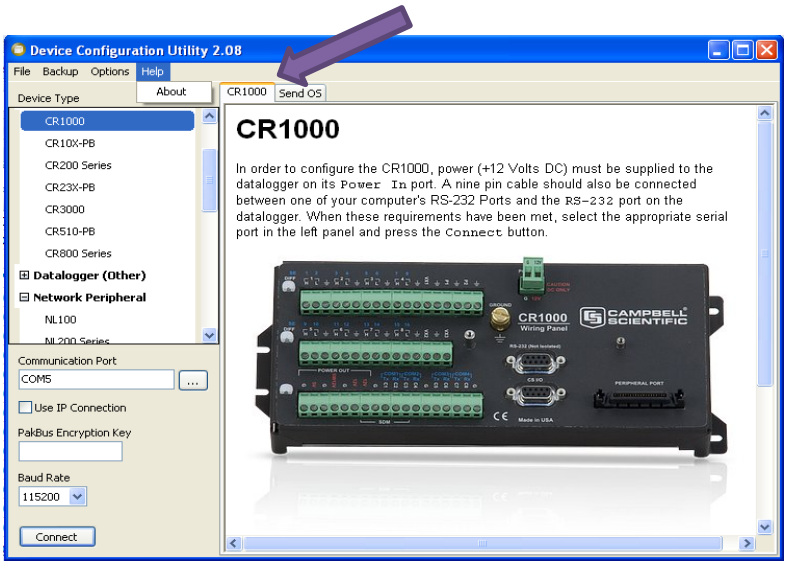
2. Save file in same folder as the station's data that was downloaded: C:\Campbellsci\LoggerNet*yyyy_retrieved_programs*,where *yyyy* is the current year. It is important to keep these files together as the program is required to fully interpret the data file.



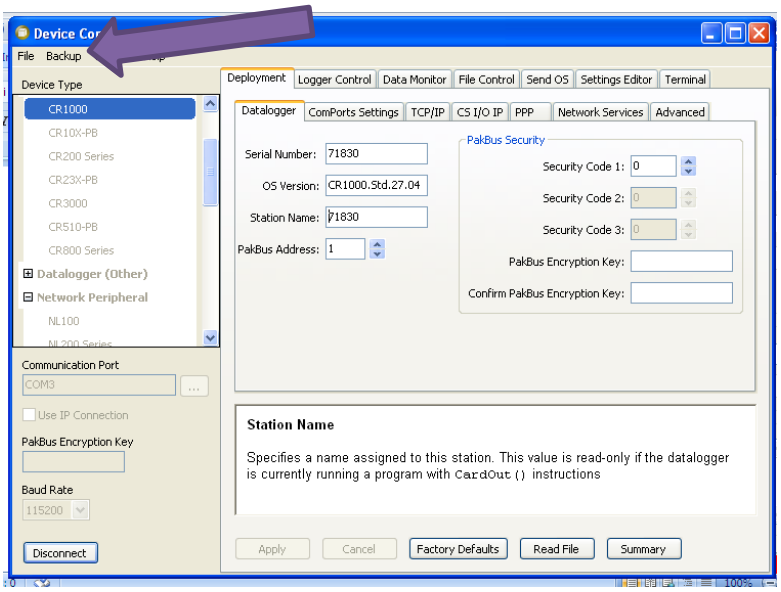
Updating the Operating System

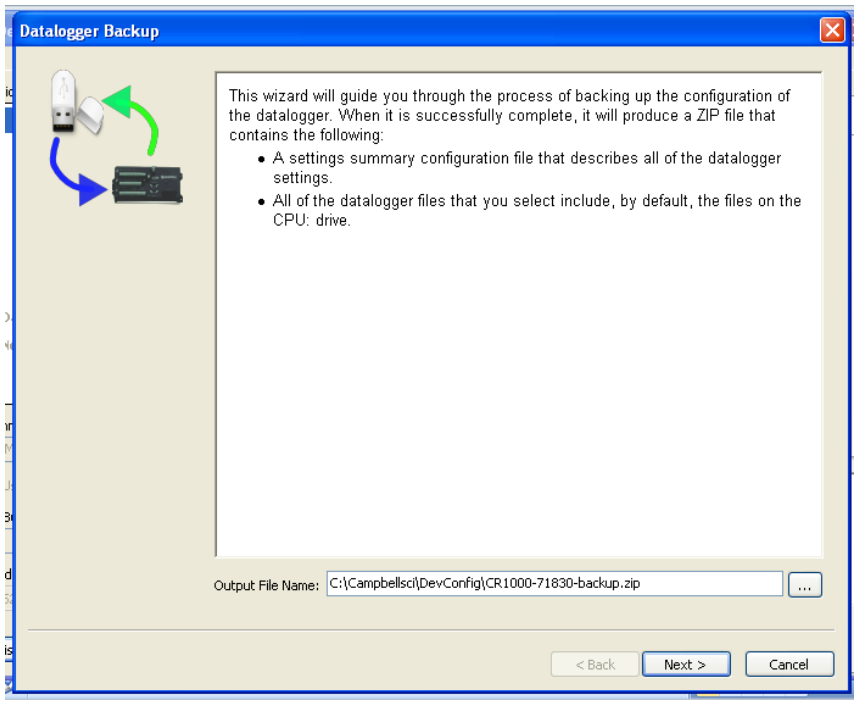
1. From the LoggerNet main menu, select **Utilities - Device Config Utility**.

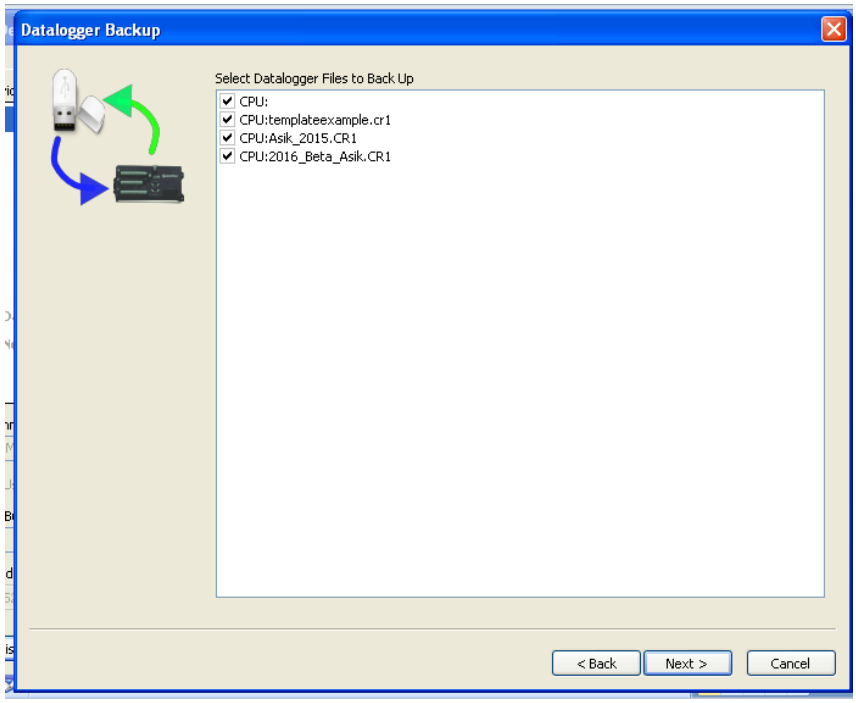
2. Device Configuration Utility can send operating systems from the Send OS tab to the CR1000. All data and programs will be lost when you send a new operating system. Select the CR1000 tab and Connect to the datalogger and select Backup from the top file menu.

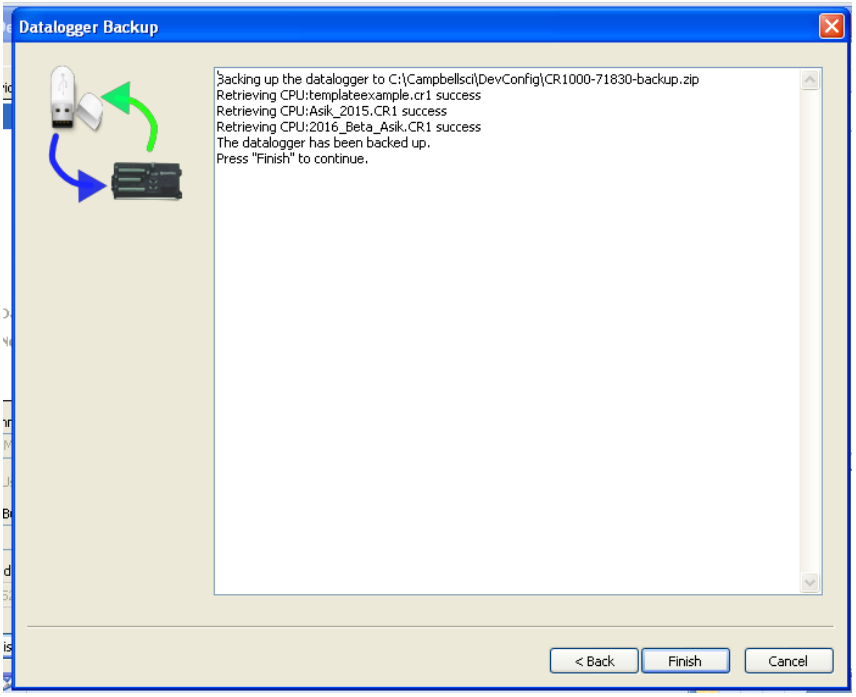


3. Follow the Backup wizard.

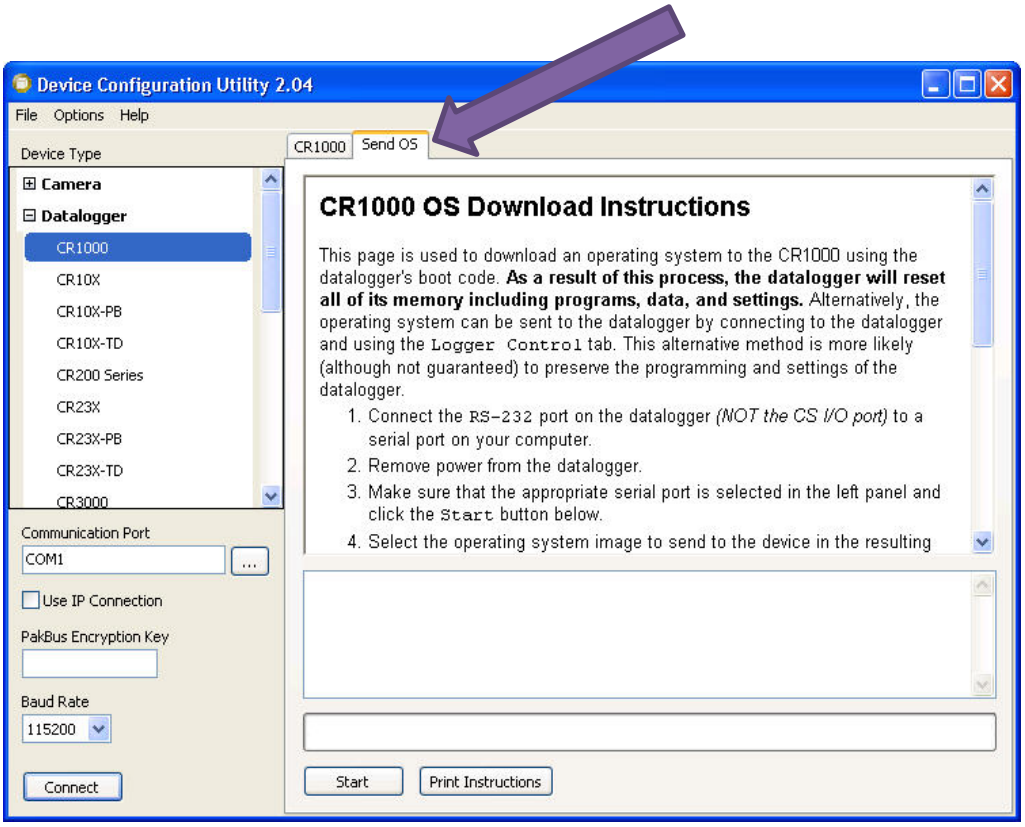



Datalogger Backup
This wizard will guide you through the process of backing up the configuration of the datalogger. When it is successfully complete, it will produce a ZIP file that contains the following:
• A settings summary configuration file that describes all of the datalogger settings.
• All of the datalogger files that you select include, by default, the files on the CPU: drive.
Output File Name:
C:\Campbellsci\DevConfig\CR1000-71830-backup.zip
...
< Back
Next >
Cancel


Datalogger Backup
Select Datalogger Files to Back Up
CPU:
CPU:templateexample.cr1
CPU:Asik_2015.CR1
CPU:2016_Beta_Asik.CR1
< Back
Next >
Cancel

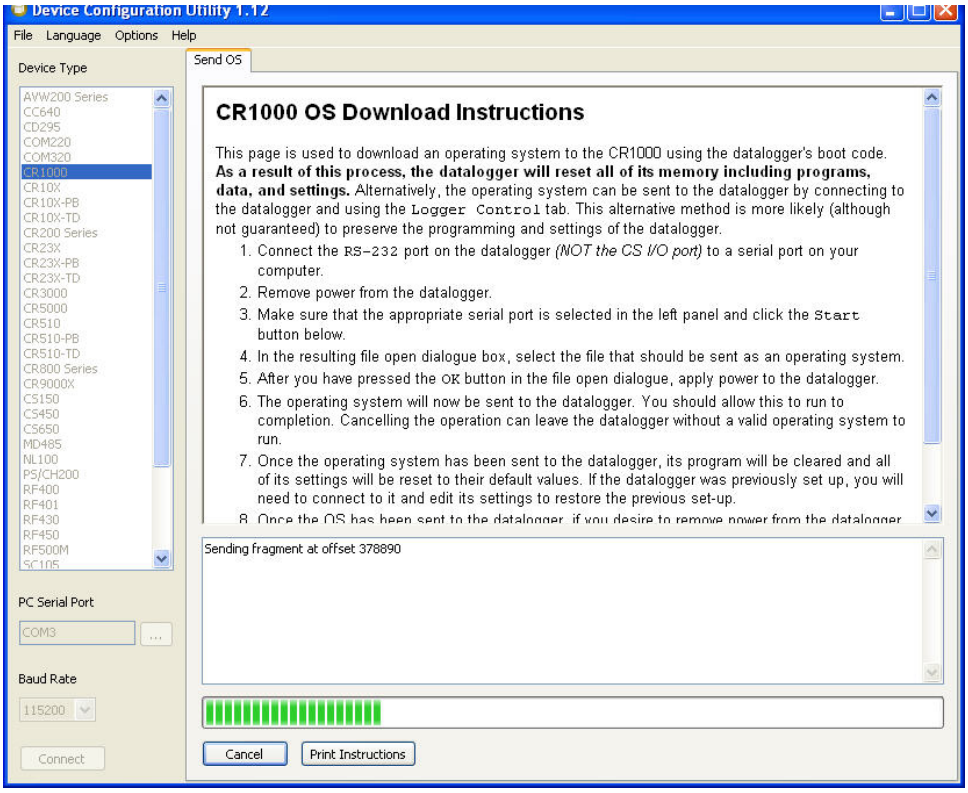


4. Next click on the Send OS tab and click Start.

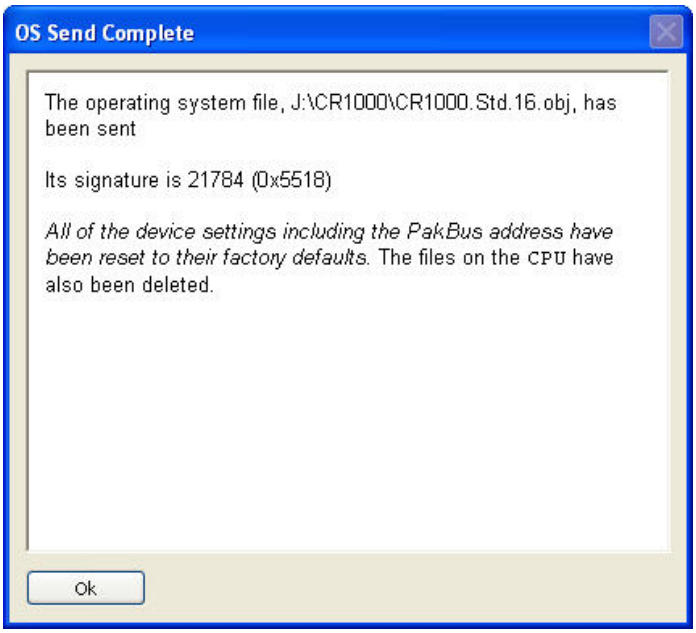


5. When you click the **Start** button, DevConfig offers a file open dialog box to prompt you for the operating system file (usually a *.obj file). You may be required to cycle power to the

device or press more buttons when the device issues the appropriate prompts, DevConfig starts to send the operating system:



6. When the operating system has been sent to the device, a message dialog will appear similar to the one shown below:

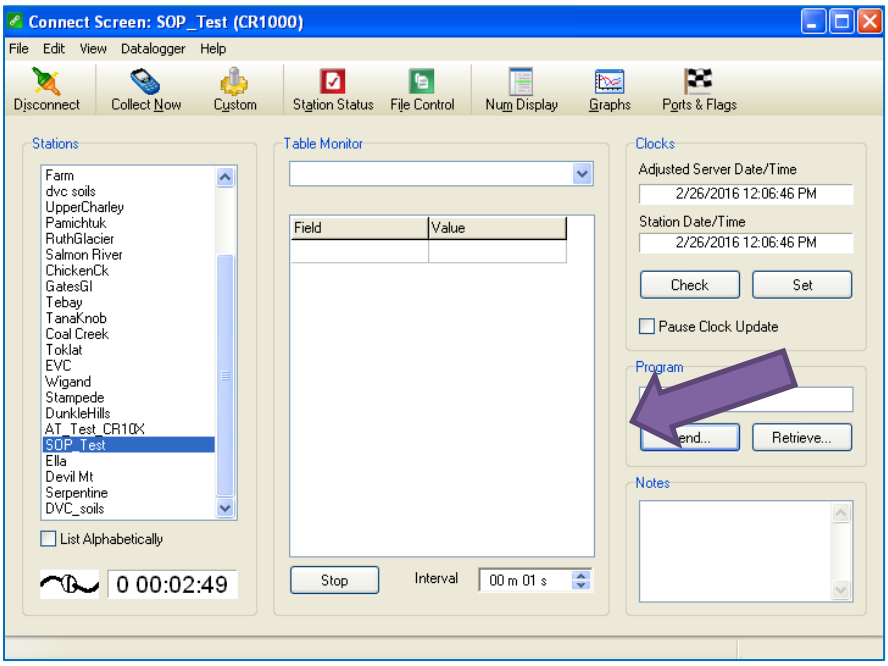


7. The information in the dialog helps to corroborate the signature of the operating system sent.

Send a New Program

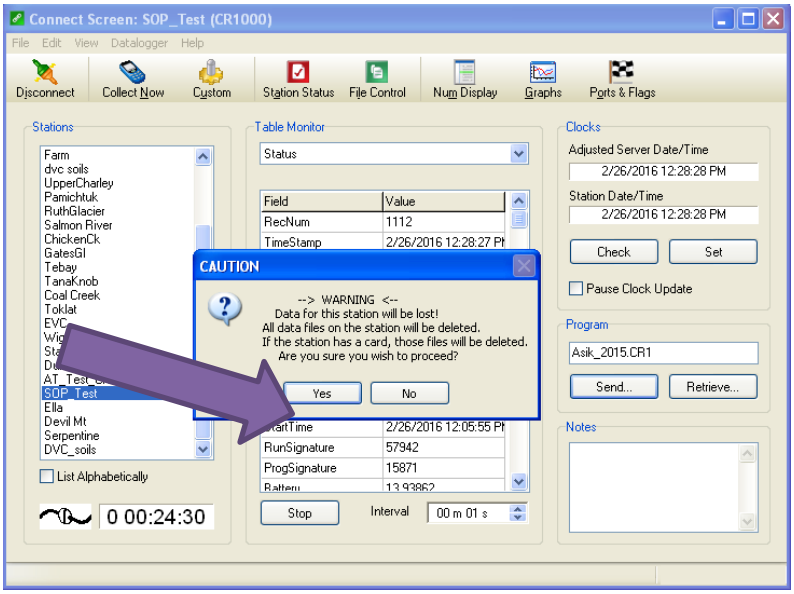
Warning! If you send a new program to the datalogger all data stored in the datalogger will be lost. Confirm that all data has been collected before sending a new program.

1. Click on the **Send**…button under **Program** on the **Connect** screen.

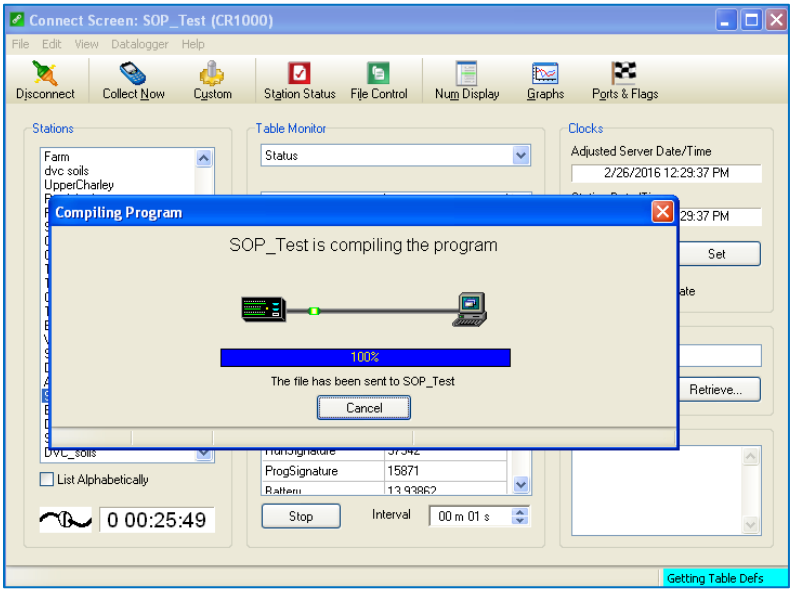


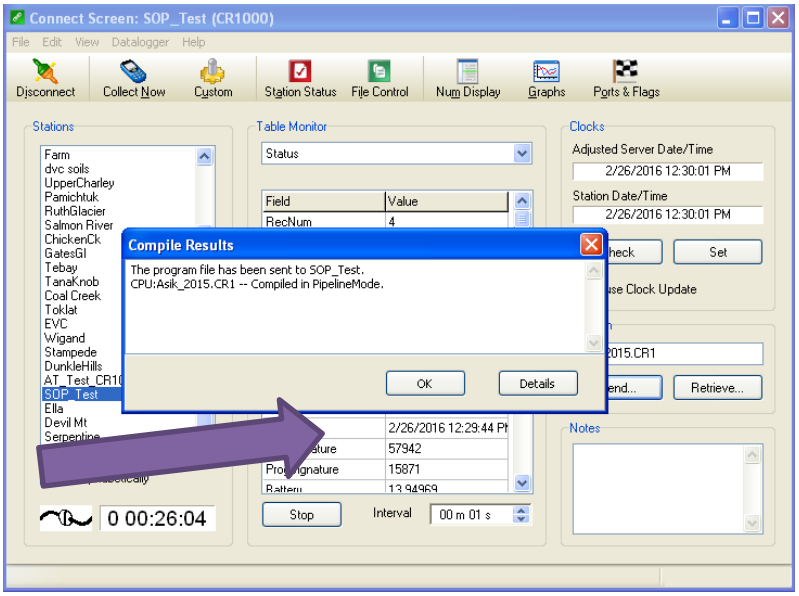
2. Select the *stationname*.CR1 file from the YYYY Datalogger Programs folder on the laptop, where YYYY is the current year. Before you leave for the field you will have considered any programming changes and planned accordingly.

3. Once you open the file the warning message about data loss will pop up and you need to select 'yes or no to proceed.



4. Select **Yes** and the file will be sent and compiled. Click **OK** when it shows that the program has been sent and compiled with no errors.





5. Confirm that the program is working by viewing the **Public** table under Table Monitor, Num Display, or Graphs icons. The program interval is 60 seconds, so wait a minute after sending a program for the data to show up in the display.

Update Program Constants

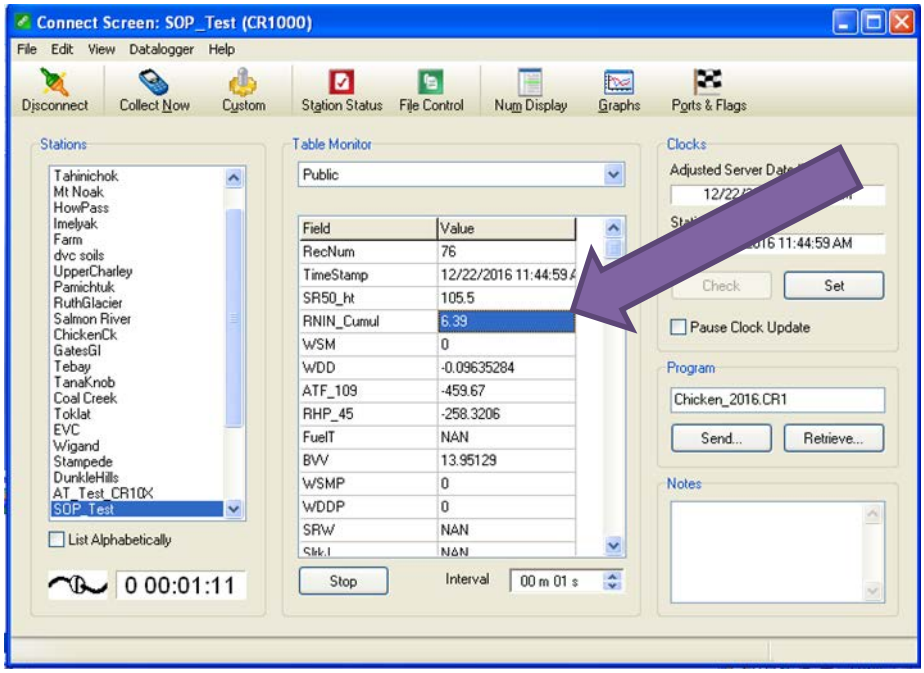
Adjust the values of program constants and accumulating variables in the **Public** table, as needed to calibrate measurements and correspond to prior readings. Highlight the value cell next to the variable with the mouse (it will turn blue) then enter the appropriate value and hit enter.

There are two program constants that need to be updated after a new program has been sent to the datalogger: 1) snow depth sensor height and the 2) cumulative rain total.

For the two different types of snow sensors in use follow these instructions:

> Judd sensor: The **JuddHeight_in** variable should be adjusted until snow depth is equal to zero during the snow-free season. When snow is present, the value should be adjusted too set snow depth equal to its last value prior to program replacement.
>
> SR50a: **SR50_ht** variable should be updated to reflect the **TCDT** (temperature compensated distance to surface) variable in the Public table.

Cumulative rain total: The **RainCumulative_in (or RNIN_Cumul)** variable should be set equal to the last value prior to program replacement to account for precipitation to date. This value was recorded on the site visit worksheet, if it was not, you can look at the data files and look at the value of the last record.


Connect Screen: SOP_Test (CR1000)
File Edit View Datalogger Help
Disconnect
Collect Now
Custom
Station Status
File Control
Num Display
Graphs
Ports & Flags
Stations
Tahinichok
Mt Noak
HowPass
Imelyak
Farm
dvc soils
UpperCharley
Pamichtuk
RuthGlacier
Salmon River
ChickenCk
GatesGl
Tebay
TanaKnob
Coal Creek
Toklat
EVC
Wigand
Stampede
DunkleHills
AT_Test_CR10X
SOP_Test
List Alphabetically
0 00:01:11
Table Monitor
Public
Field
Value
RecNum
76
TimeStamp
12/22/2016 11:44:59
SR50_ht
105.5
RNIN_Cumul
6.39
WSM
0
WDD
-0.09635284
ATF_109
-459.67
RHP_45
-258.3206
FuelT
NAN
BVV
13.95129
WSMP
0
WDDP
0
SRW
NAN
Stop
Interval
00 m 01 s
Clocks
Adjusted Server Date
Check
Set
Pause Clock Update
Program
Chicken_2016.CR1
Send...
Retrieve...
Notes

Appendix SOP 9 – C. Downloading Data with Archer Handheld Field Computer

This SOP describes the procedures to operate the Archer handheld field computer. The Archer uses the Windows Mobile operating system and PConnectCE software to connect with Campbell Scientific dataloggers. Station data can be downloaded, real-time data viewed, and programs transferred between the Archer and datalogger. To synchronize data and program files between a personal computer (PC) and the Archer, use ActiveSync software included with purchase of the Archer.

Procedures

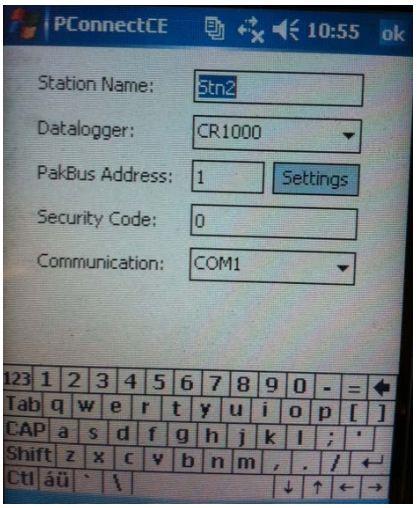
1. Install PConnectCE (Campbell Scientific software for the Archer) and Windows Mobile (distributed with the device) from the installation disc provided by the program manager. Carefully follow the installation instructions from the Campbell Scientific manual available online at http://www.campbellsci.com/documents/manuals/pconnectce-pocket-pc.pdf. It is recommended to synchronize data files and program files between the Archer and office desktop at C:\Campbellsci\PConnectCE\. It is also possible to manually add files from the desktop to the Archer and bypass automatic synchronization.

2. Place the Archer on the charging dock and connect the dock to the PC through the USB port. Sync the files between the Archer and PC, or manually transfer files. If using the manual mode, transfer downloaded data files to the PC, and transfer program files from the PC to the Archer. **Confirm that the current programs are loaded on the Archer** (see step 3 below).

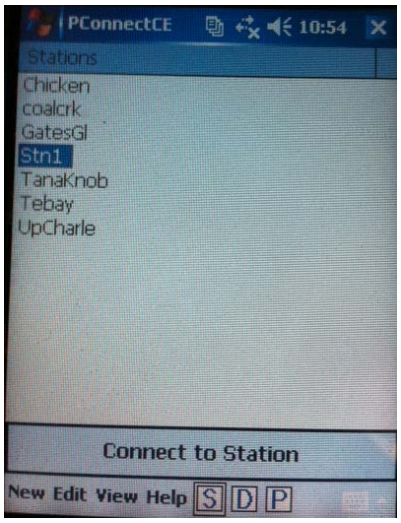
3. Open PConnectCE software from the Start menu of the Archer. PConnectCE has three primary functions designated by small boxes at the bottom of the screen. **S** indicates **stations** available to directly connect with. **D** indicates **data files** to view and delete. Double-click the files to open them on the Archer. **P** indicates **program files** available to view and delete. Double-click to open the files.

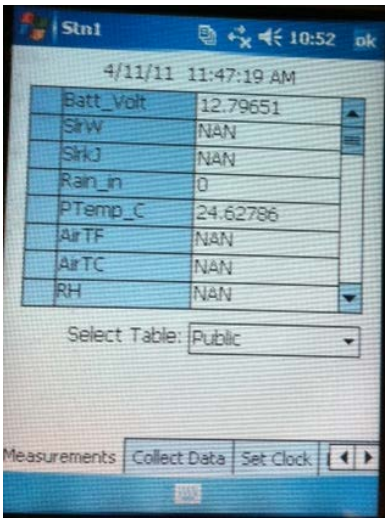
4. Using a serial cable and datalogger interface, make a physical connection between the Archer and CR1000 datalogger. Two options are possible. 1) the SC32B interface with a male/female serial cable. The interface connects directly to the CS I/O port of the logger as labeled. The male end of cable connects with the female side of the interface. The female end of the serial cable connects directly to the Archer. 2) the Archer-to-CS I/O interface with a female/female serial cable.

5. Create a new station by clicking **New** in the lower left corner of PConnectCE. Select **CR1000** and click **OK**. Name the station and modify the PakBus Address and Communication as needed. Verify the default PakBus Address of 1 and Communication default of COM1. Press **OK** in the upper right corner and save the changes. The new station appears on the list.

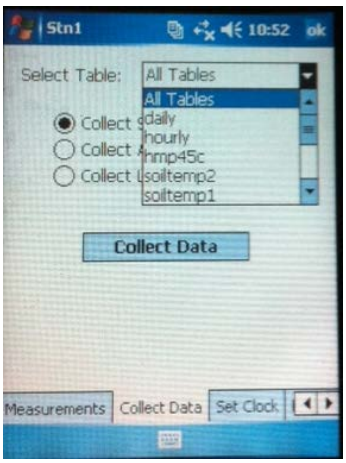


6. Connect to the station by highlighting it and clicking **Connect to Station**. If power is supplied to the datalogger, all cables are healthy and connected correctly, and all communications information (PakBus, ComPort, etc.) are in order, the Public table of the datalogger will load and display real-time values updated at each scan interval (60 seconds). Under the **Measurements** tab, it is also possible to view other tables called in the program using the drop-down menu.

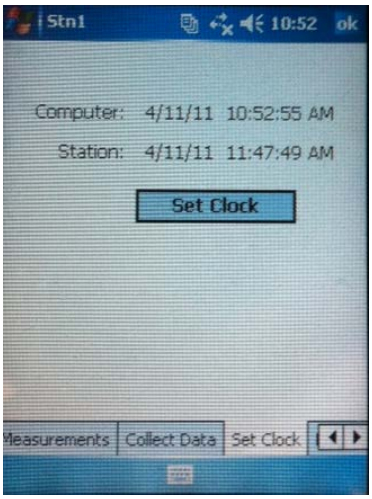




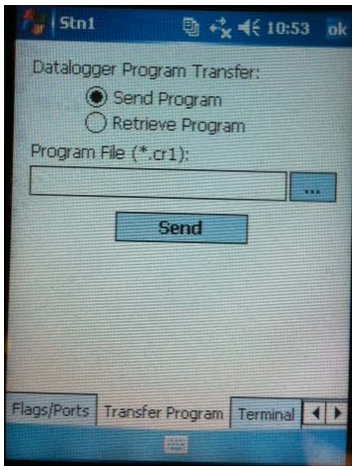
7. While connected to the station, click the **Collect Data** tab. Choose the tables to download and choose the desired type of collection. To maintain good file management and reduce download time, it is recommended to **Collect Since Last Time** only the **hourly** table. After clicking **Collect Data**, the data are downloaded and message is displayed indicating a successful collection.



8. The **Set Clock** tab allows the station clock to be set based on the computer clock (UTC). This is also possible from the laptop via LoggerNet (see SOP #5).



9. The **Transfer Program** tab allows the user to send or receive programs to/from the datalogger. Programs are available that have been synched through ActiveSync on the office desktop. Before site maintenance, ensure that the current programs are synched on the Archer. Confirm that all data has been downloaded before sending a new program.



10. Power off the Archer while it is not in use to conserve battery. Hold down the power button and choose **Power Off.**

Appendix SOP 9 – D. Photographic Documentation

This appendix explains the procedures for proper photographic documentation of a weather station and its surroundings. A diagram is provided that illustrates the photograph locations and the directions in which to take each photograph. This diagram is intended to assist the user in the photographic documentation process and is included on the site visit worksheet for reference. A list of necessary tools and equipment is provided. The procedures outlined below provide a method for consistently capturing the exposures and overall physical setting of a station.

Digital Camera Settings

Specific camera settings will vary between camera manufacturers, models and change with different circumstances and exposures. The following guidelines will require referring to the camera manual for determining specific settings.

Process

1. Using a compass or GPS, identify positions that are between 50-100 feet from the station in each of the cardinal directions (N,S,E,W) and secondary directions (NE,SE,SW,NW). The tripod leg right below the enclosure always points north, so you can use that to orient you.
2. Begin at north cardinal direction, labeled as N (1) on accompanying station map (Figure 1).
3. Take picture in landscape orientation (not portrait). The weather station structure should occupy 50-70% of the vertical frame. Try to take photograph as level (both vertically and horizontally) as possible, even if the station is positioned above or below the photograph center position.
4. Note your location relative to the station (the attached sheet should be used for this purpose). Items that should be noted here include the photo sequence.
5. Go to the next position (labeled NE (2) on Figure 1), checking your distance and orientation, and repeat step 3.
6. Repeat steps 3-4 until station photographs have been taken at all 8 positions.
7. Return to the same cardinal compass point (labeled N (2) on Figure 1) as you started at in step 2, but now orient yourself so that the weather station is 5 to 10 feet behind you and aim away from the station.
8. Take picture in landscape orientation. Photo should be level to horizon, even if there is a tree, cliff, wall, other obstacle, or open horizon. Double-check where the camera is being aimed. Without a subject (weather station) it can be easy to point at another subject and not toward the compass direction desired. Note your location relative to station and record same information as in step 2.
9. Repeat step 8 for each of the 8 positions. It is best to go around these positions in the same order as in steps 2-3.

Additional photographs: It is useful to have a close-up photo of the inside of the enclosure and of any sensors or part of the station that is different than the normal set-up. Additional photographs may be taken that show any element of interest that might not have been captured in the sequence. These

may include photos from a greater distance that illustrate the station exposure. Make every effort to ensure that the weather station is visible in the station photos (or at least identifiable) and not hidden.

Required Tools and Materials

- Camera
- Extra batteries for camera or means to recharge
- Compass
- Copy of photo documentation key map.

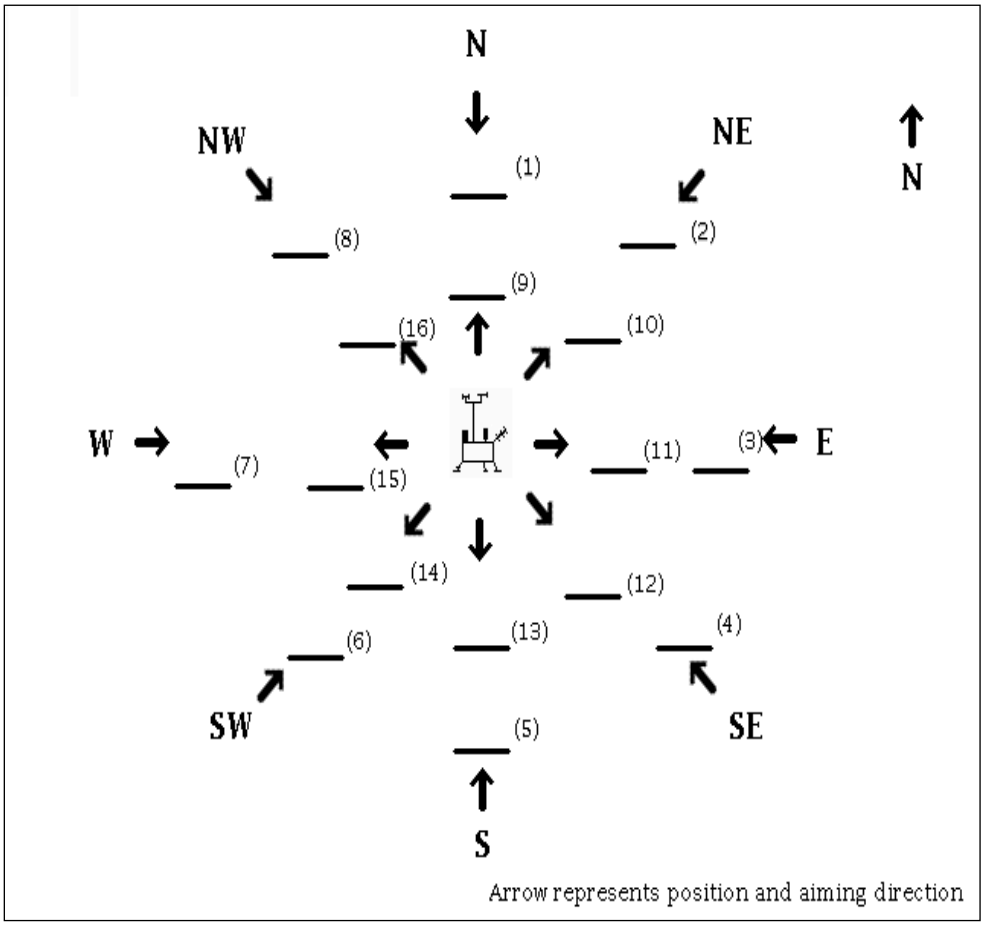


Figure SOP 9-A1. Photo documentation key map.

Appendix SOP 9 – E: Phenology Camera Setup and Operation

Note: Phenology cameras are installed at the Upper Charley (YUCH) and Gates Glacier (WRST) in CAKN. The procedures for setting up and operating the cameras are included as part of the Arctic Network's Terrestrial Landscape Patterns and Dynamics protocol (Swanson 2016). The procedures are outlined in Appendix C of the protocol and replicated here for convenience:

Background

The camera setup is based on the Campbell Scientific manual for the CC5MPX camera. Camera settings and data download are made using an Ethernet cable and internet browser.

Wiring

1. Connect the red wire to power, and the black, white, and clear to ground.

Configure Laptop/Ethernet on field laptop

1. Connect the camera to the computer with an Ethernet cable.
2. Open Control Panel-Network Connections-Local Area Connection-Internet Protocol (TCP/IP), IP Address 192.168.1.91, Subnet mask 255.255.255.0, Default Gateway 192.168.1.1
3. Right Click Local Area Connection and click Repair
4. Open Web Browser and go to http://192.168.1.90

Test Camera before departure.

1. Update firmware
2. Format SD Card (use one with extended temperature testing) and install.
3. Configure Power Modes to maximum power saving settings (DEEP SLEEP state and FULL POWER SAVE MODE)
4. Configure image capture intervals: 5 images/day at hourly intervals between 10:00-14:00, adjusted to local solar noon.
5. Configure still image settings (date, time, and station name on the outside of the image). The filename scheme is XXX00_YYYY_MM_DD_HH_NN where XXX is the 3-letter AICC station code (Table 1) followed by 2 zeros, followed by the year, month, date, hour, and minutes.
6. Set still images to high resolution

Field Setup

1. Align the scene (generally north-facing)

2. Zoom and Focus
3. Maximize Focusing Number
4. Take a test image from home screen

Retrieve images

1. Open in Windows Explorer (NOT Internet Explorer) and navigate to ftp://192.168.1.90:85
2. Copy all photos to folder named with year and site.
3. Back up photos to USB device on computer.
4. Double-check that photos are copied and delete from camera SD card

Transfer images to network

1. Upon returning to the office, copy all photos from field laptop to network folder labeled by the site and year. Verify photo transfer and delete photos from the laptop.
2. Keep photos on the backup USB device until backup of the network drive has occurred.

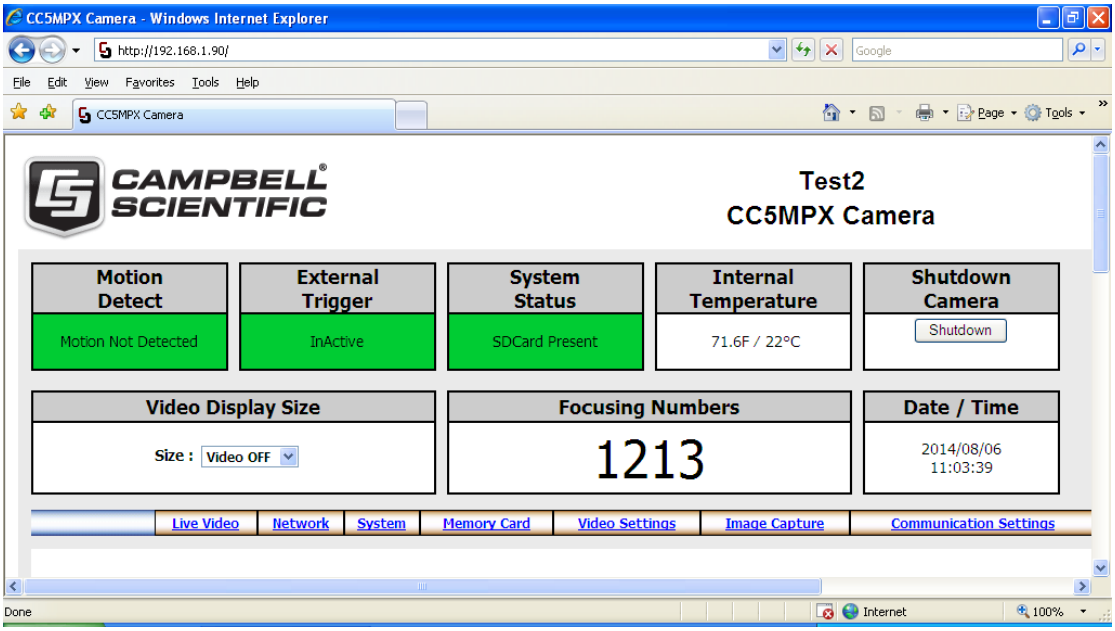
Equipment

- Camera with sun shield
- Power cable (in conduit)
- Protective Conduit for power cable
- Battery with enclosure mount
- Solar panel with mount and U-bolts
- Wind pipe (Aluminum 1”)
- Camera mounting hardware and U-bolts

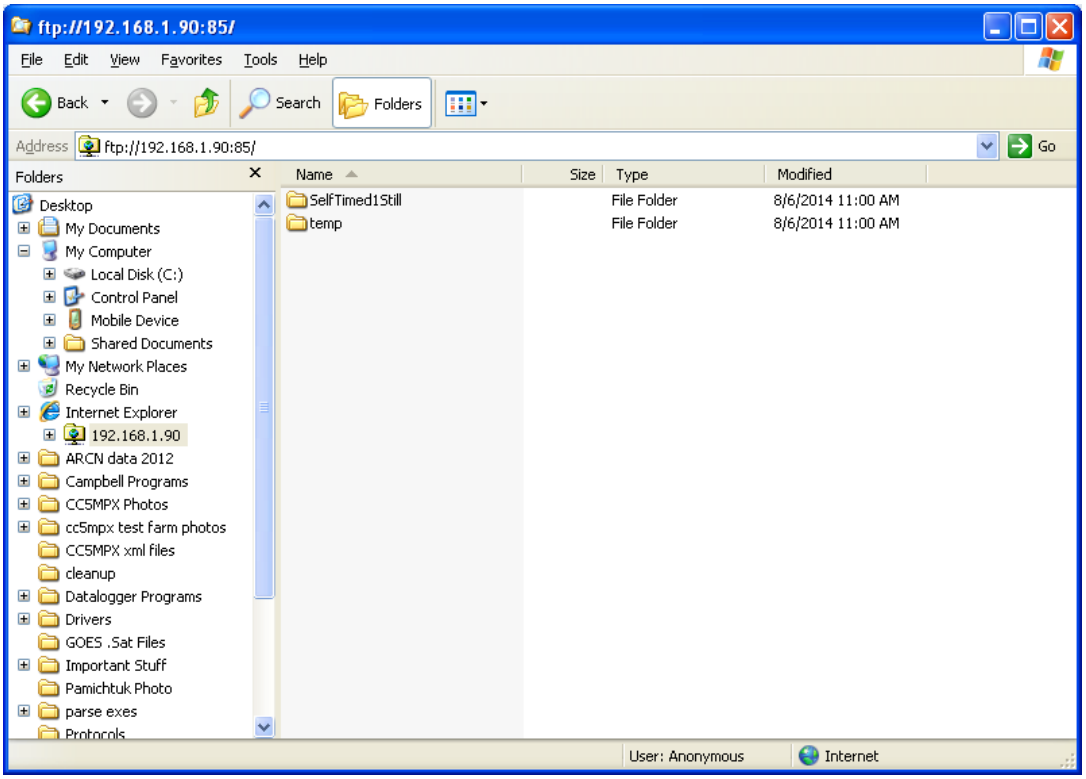
Details on Connecting Laptop to Camera in the Field

1. Turn on camera by pushing power button.
2. Open Internet Explorer. Wait about 90 seconds (until red light goes from solid on to either blinking or off)
3. Connect to Camera
    a. Navigate to http://192.168.1.90/ (camera should connect and page should open for CC5MPX options.
    b. If no connection is made, but the red light is still on, the camera is probably still booting up. The camera takes 1-3 minutes to warm up, and stays active for 1 minute after it has started before going back to sleep (unless the user is actively using the

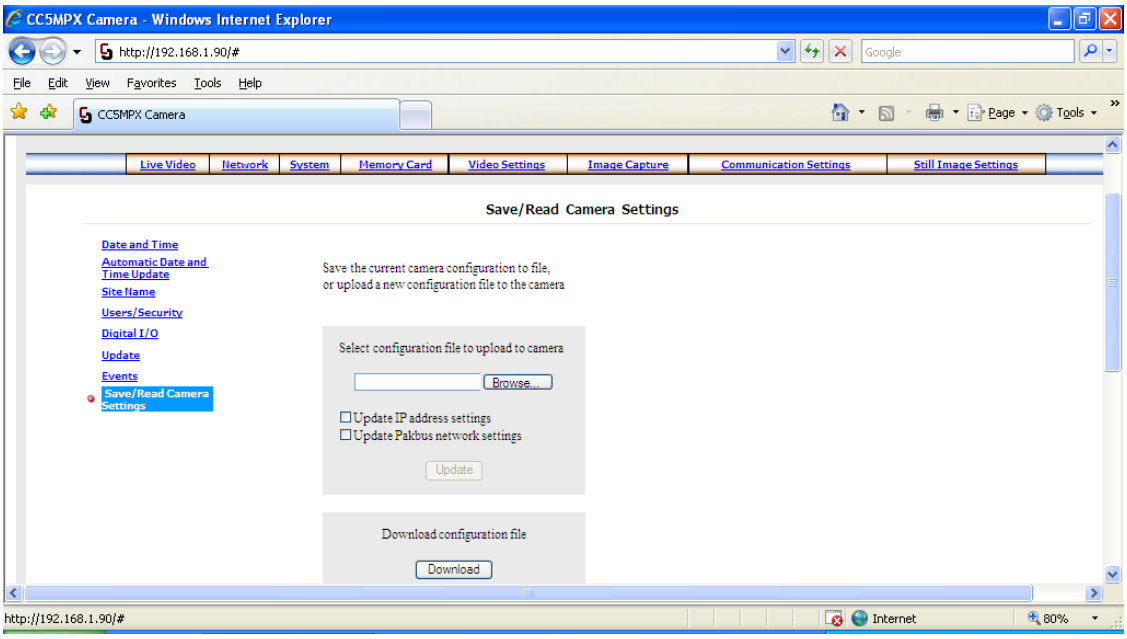
camera to change settings, download images, etc.) Keep trying to navigate to the 192. address, or push the button on the camera again.



4. Open a window in Windows Explorer (not Internet Explorer), “My Computer”, etc.
    a. Navigate to ftp://192.168.1.90:85/ to connect to camera
    b. Transfer all files from Self Timed Still folder on camera to laptop and/or a USB memory stick.
    c. After all images have been transferred (20-30 minutes), delete all images and folders from the camera.

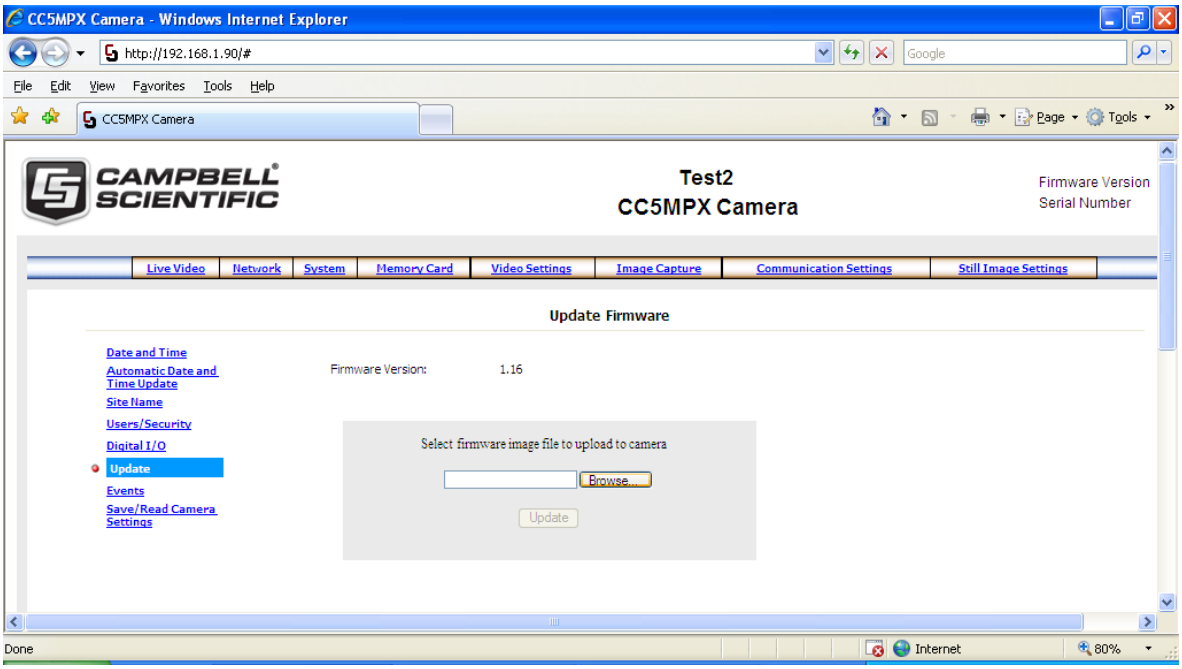


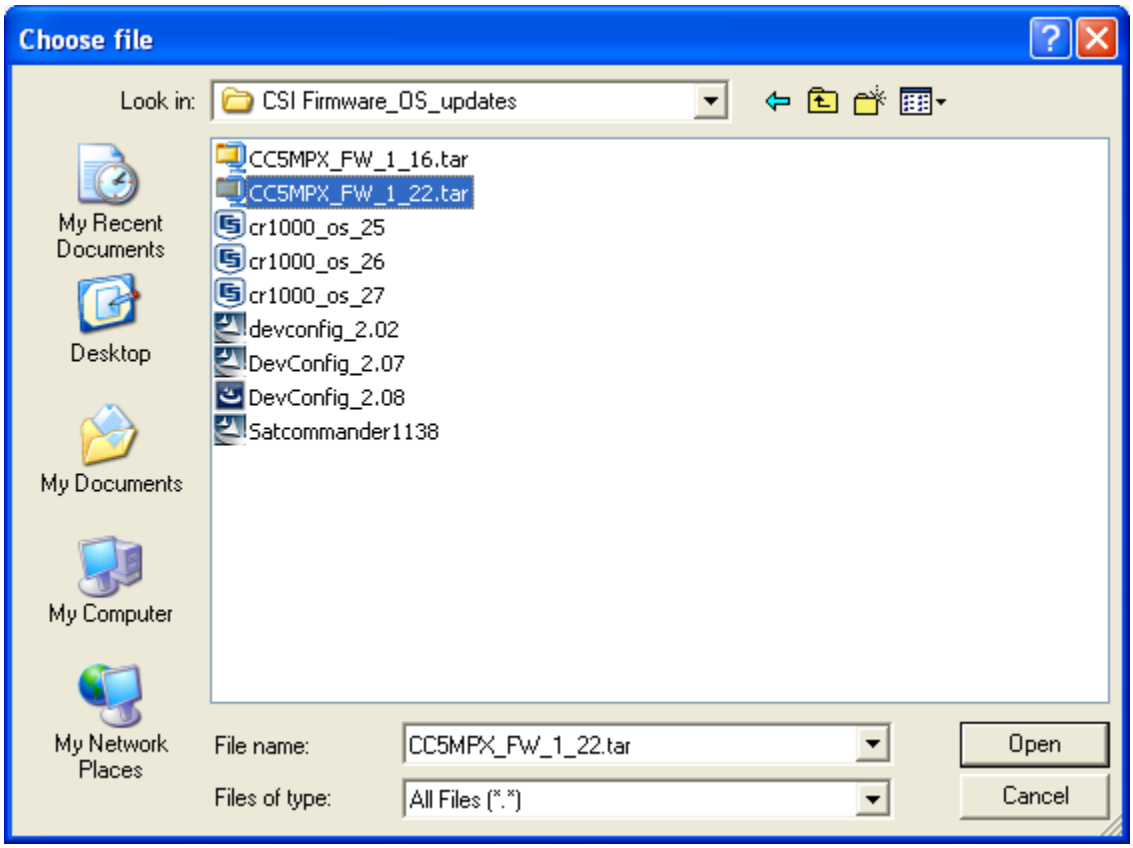
5. Reopen Internet Explorer and navigate to http://192.168.1.90/
    a. Open a live feed of the image under the video display.
        i. Ensure that the image frame looks good and that the image is in focus.
    b. Open the System Tab from the main page.
        i. Ensure that the date/time is nearly accurate. If not, sync with computer time
        ii. Click the Save/Read Camera Settings on the left frame.
            1. Download the configuration file to the laptop. This is a record of the settings currently in the camera.



iii. Click on Update on the left frame.

1. Install the latest firmware version by clicking on Browse… and navigating to the firmware file on the USB stick at E:\CSI Firmware_OS_updates\CC5MPX_FW_1_22.tar
2. After you have chosen the 1_22 file, click Update.
3. Wait 2-3 minutes for the firmware to install. You should get a message saying “Reprogramming Successful…”
4. The camera will restart automatically. After it restarts (1-2 minutes), the camera may automatically enter “deep sleep” mode. Press the power button manually, wait 90 seconds until the red light goes from solid to either off or blinking, and reconnect in Internet Explorer at http://192.168.1.90/.



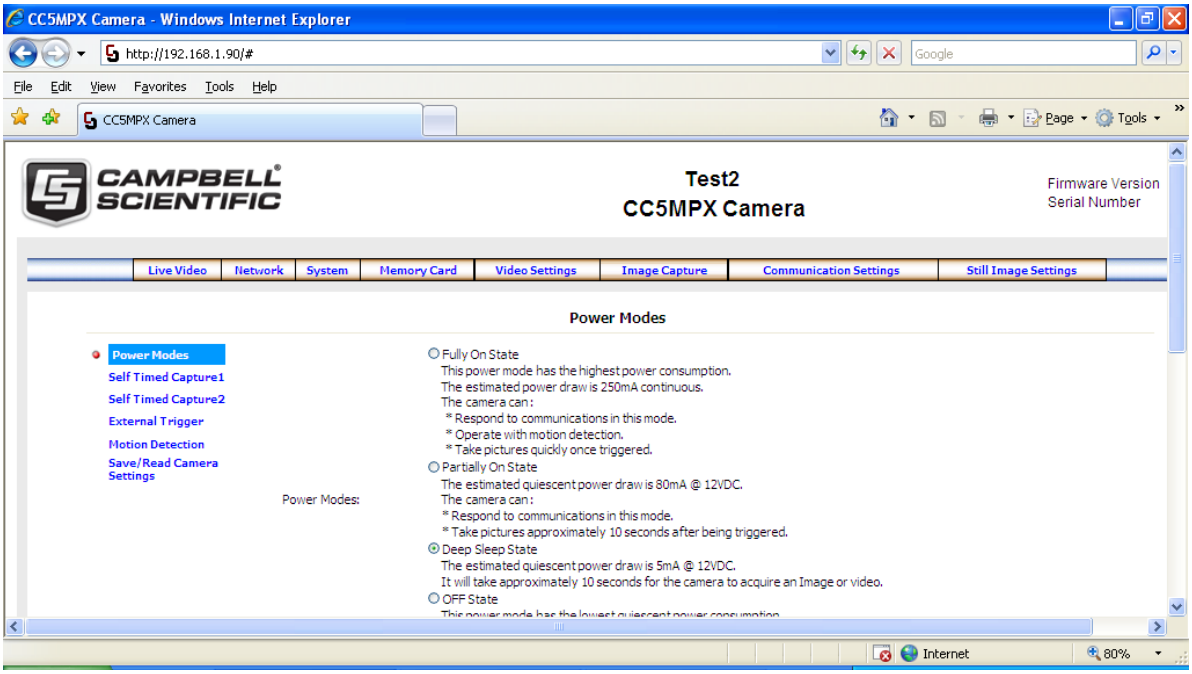


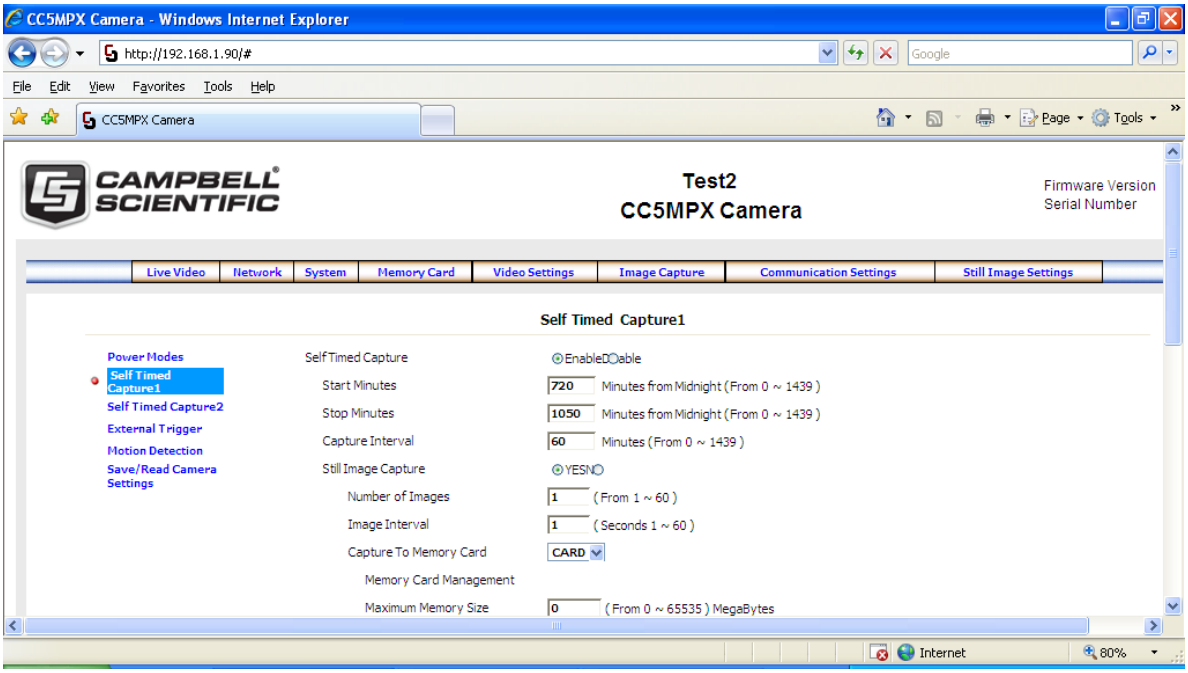
c. Open the Image Capture tab from the main page.

i. Change the Power Mode from OFF state to DEEP SLEEP State. Click Submit.

ii. Click the Self Timed Capture1 on the left frame.

   1. Set the Start Minute to 720 minutes
   2. Set the Stop Minutes to 1050 minutes
   3. Ensure that the Capture Interval is 60 minutes.
   4. Click Submit at the bottom of the page.





d. Return to the Live Video Main Page
    i. Push the Shutdown button to Shutdown the camera.
    ii. Replace the caps on the camera before leaving.
    iii. Clean the lens on the camera with a soft cloth.

6. If the camera is not working, replace it.