1.0 Purpose and Scope

This procedure prescribes the Sandia National Laboratories (SNL) Waste Isolation Pilot Plant (WIPP) process for the collection of wind direction and wind speed in the vicinity of the WIPP using an RM Young Wind Sentry Set with data recorded by a Campbell Scientific CR300 Datalogger. The objectives of this procedure are to describe the operation and maintenance of the Wind Sentry Set and to provide a procedure for a laboratory performance check of the Wind Sentry Set.

This Activity/Project Specific Procedure is intended to direct SNL technical personnel in the procedures needed to obtain high-quality data that meet WIPP Quality Assurance (QA) standards. All activities will be documented in the appropriate Scientific Notebook (SN) according to Nuclear Waste Management Procedure (NP) 20-2, “Scientific Notebooks”. This SP is in support of activities described in WIPP Test Plan (TP) 21-01, “Test Plan for the Southeast Arm of Nash Draw Water Balance Study”.

Acronyms and definitions for terms used in this procedure may be found in the Glossary located on the Sandia National Laboratories (SNL) WIPP Online Documents web site.

2.0 Implementation Actions

2.1 Safety

The activities described in this SP shall conform to SNL Environmental Safety and Health programs (ES&H). All activities described in this SP are also subject to ES&H requirements governed by the WIPP Industrial Safety Program and the WIPP Industrial Hygiene Program when work is conducted within the WIPP site land withdrawal boundary.

2.2 Responsibilities

The Principal Investigator (PI) is responsible for implementing the requirements of this procedure.
The Technical Staff are responsible for performing the measurements following the requirements of this procedure, documenting all required information described in this SP, and assuring the latest revision of this document is followed.

If the procedure cannot be worked as written, the user has the responsibility to stop work and resolve all concerns with the PI, safety, and/or QA, as appropriate, prior to proceeding with the work.

2.3 Equipment

2.3.1 RM Young Brand Wind Sentry Set

Wind direction and wind speed data will be collected using an RM Young brand Wind Sentry Set. The RM Young Wind Sentry Set, model 03002, consists of both a wind speed and wind direction component mounted on a small crossarm. The wind speed sensor is a 3-cup anemometer, and the wind direction sensor consists of a wind vane. A single cable leaves the cross arm and is hardwired to a Campbell Scientific CR300 datalogger, which is programmed to collect and store wind direction in degrees and wind speed in miles per hour (mph) or meter per second (m/s).

The Wind Sentry Set is a precision instrument and should be handled with care. Avoid dropping the device and other types of shock. During transportation, the instrument should be placed in the original packaging to prevent damage to the vane or cups by lateral shocks or vibration.

2.3.2 Campbell Scientific CR300 Datalogger

The Wind Sentry Set is connected to a Campbell Scientific CR300 datalogger which records wind direction and wind speed data. CR300 program installation is described in *Telemetry Station Datalogger and Radio Programming Operator Aid (Appendix C)*. The CR300 will record averages, maximums, and minimums over a 15-minute period starting at the top of the hour. The Wind Sentry Set performance check is done in the laboratory using a CR300 using the public table displaying instantaneous values, from the program Sandia_Wind_Sentry_Cal.cr3 (CRBasic Program used for Verifying an RM Young Wind Sentry Set, Appendix B).

2.3.3 Wind Direction/Wind Speed Performance-Check Kit

The Wind Sentry Set Performance-Check Kit contains an anemometer drive to test the wind speed signal, a propeller torque disc to test wind speed and wind direction thresholds, and calibration mount with 45° cross markings to test the wind direction signal. The anemometer drive will be calibrated on an annual basis at an SNL certified laboratory.

2.4 Wind Direction/Wind Speed Setup

The steps in this section apply to the normal installation and removal of an RM Young Wind Sentry Set for maintenance purposes at an existing site.

The Wind Sentry Set will be deployed per manufacturer and industry standards. The Wind Sentry Set MUST be mounted:

- Away from obstructions
- A horizontal distance of at least ten times the height of the nearest obstruction
The Wind Sentry Set is wired to the CR300 by a cable from the J-box on the crossarm. Connect the red wire to the $P_{LL}$ port on the datalogger. Connect the green wire to the SE5 port on the datalogger. Connect the blue wire to the VX1 port on the datalogger. Connect the white wire to the CR300 ground symbol and connect the black and clear wires to the CR300 ‘G’. Maintain good cable management by routing the Wind Sentry Set cable appropriately and affixing zip ties where necessary.

2.5 Logging Setup and Data Download

Campbell Scientific LoggerNet software on the EON “Bambi” telemetry automatically collects all CR300 datalogger data daily, including wind speed and direction data, after being set up as detailed in the Telemetry Station Datalogger and Radio Programming Operator Aid (Appendix C). All meteorological sites have gone through this procedure before being installed in the field. Each CR300 maintains data in memory even after data collection has occurred. To manually collect data, gain access to the LoggerNet software on the EON telemetry computer, connect to the selected site, and click “Collect Now”, or refer to the Telemetry Station Datalogger and Radio Programming Operator Aid (Appendix C).

The CR300 is programmed with one data table which includes wind direction and wind speed data. Data is collected every 15 minutes starting on the top of the hour. The data table has a column for a 15-minute incremental average, maximum, and minimum values.

2.6 Wind Direction/Wind Speed Maintenance

A monthly visual and audio check should be performed to inspect the anemometer at low wind speeds. Verify that the cup assembly and wind vane rotate freely, as well as inspect for physical damage. For operational accuracy, a field check is recommended at 6 months, and upon installation on a tower. A laboratory performance check should occur on an annual basis or anytime maintenance is performed. Form SP 12-43-1 will be used for the installation, 6-month check, and the annual performance check. The sensors should be returned to Campbell Scientific if bearings become noisy or the wind direction potentiometer signal noise or non-linearity becomes unacceptable.

2.7 Wind Direction/Wind Speed Performance Check

The RM Young Wind Sentry Set requires an annual laboratory performance check and a 6-month field check. The procedure is as follows:

1. Connect the Wind Sentry Set wires to a CR300 with the Sandia_Wind_Sentry_Cal.cr3 program installed.
Wind Measurements Using an RM Young Wind Sentry Set
and Campbell Scientific CR300 Datalogger

2. Connect the red wire to the P_LL port on the datalogger
   o Connect the green wire to the SE5 port on the datalogger
   o Connect the blue wire to the VX1 port on the datalogger
   o Connect the white wire to the CR300 ground symbol
   o Connect the black and clear wires to the CR300 ‘G’

2. Open Campbell Scientific Loggernet software.
   o Supply 12VDC power to the datalogger
   o Connect the USB cable to the CR300 and laptop
   o Open Loggernet and click “Connect”
   o Select the Public table in the Table Monitor window

3. Perform wind direction signal performance check:
   o Hold the instrument so the vane center of rotation is over the center of the wind calibration mount which has 45° crossmarkings
   o Position the instrument so the mounting crossarm is oriented north-south with the vane on the north and the anemometer on the south.
   o With the counterweight pointing directly at the anemometer, the wind direction signal should correspond to 180° or due south.
   o Looking from above, visually align the vane with each of the calibration mount crossmarkings and observe the wind direction reading on Loggernet (“WindDir”).
       ▪ The readings on Loggernet should correspond to vane position within 5°. If not, it may be necessary to adjust the relative position of the vane skirt and shaft. See manufacturer’s manual for further instruction.

4. Perform wind direction threshold performance check:
   o Remove Propeller
   o Set torque disc to proper torque (0.3 gm-cm)
   o Install torque disc on propeller shaft and check rotation of disc
   o Free rotation indicates good bearing/transducer condition, failure to rotate indicates need for service

5. Perform wind speed signal performance check:
   o Remove the cup wheel and connect the anemometer drive to the cup wheel shaft
   o Drive propeller shaft at 200 rpm
   o Observe the Loggernet output for the wind speed (“WS_mph”) associated with 200 rpm by referring to the table below.
   o Drive propeller shaft at three other rpm values throughout the working range of the propeller, checking output signal at each speed, including 0 rpm.
       ▪ If readings are not within 1.1 mph, a calibration on the sensor can be performed by adding an offset to the Loggernet program, see manufacturer’s manual for further instruction.

<table>
<thead>
<tr>
<th>Cup Wheel RPM</th>
<th>Wind Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>200</td>
<td>6.04</td>
</tr>
<tr>
<td>600</td>
<td>17.22</td>
</tr>
<tr>
<td>1200</td>
<td>34.00</td>
</tr>
<tr>
<td>1800</td>
<td>50.78</td>
</tr>
</tbody>
</table>

6. Perform wind speed threshold performance check:
   o Remove vane
   o Set torque disc to proper torque (0.3 gm-cm)
   o Install torque disc on vane shaft and check rotation of disc
   o Free rotation indicates good bearing/transducer condition, failure to rotate indicates need for service
7. Document all adjustments made and perform an As-Left performance check to ensure the Wind Sentry Set is working properly.

8. If the Wind Sentry Set passes the performance check, reinstall in the field:
   - Secure the Wind Sentry Set on the mounting post. Do not tighten band clamp yet.
   - Connect sensor cable to CR300 following wiring scheme in section 2.4.
   - Align the vane by orienting the mounting crossarm north-south with the vane on the north and the anemometer on the south.
     - Use Brunton compass with correct magnetic declination (6.7° at SNL-16) by holding the compass waist-height, looking into the mirror to line up the target, the needle, and the mirror guide-line to confirm north-south orientation of the mounting crossarm.
     - Tighten mounting post band clamp.

If the Wind Sentry Set fails to meet the As-Found performance check criteria, a Corrective Action Request (CAR) will be issued to document the results and impacts related to the change in the Wind Sentry Set’s performance.

If the Wind Sentry Set fails to meet the performance check criteria before field deployment, repeat the adjustments per the manufacturer’s manual. Remove the Wind Sentry Set from service if it fails the performance check three times. Tag and label the Wind Sentry Set accordingly, and if practical, return it to the manufacturer for repair and calibration.

2.8 Wind Direction/Wind Speed Data Storage

All data collected by the CR300 Datalogger will be uploaded to the EON Telemetry computer (“Bambi”) on a regular schedule.

3.0 Records

The following records, generated through implementation of this procedure, shall be prepared and submitted to the WIPP Records Center in accordance with [NP 17-1](#) (Records):

   QA Record
   - Scientific Notebooks
   - Form SP 12-43-1

4.0 Appendices

Appendix A: Form SP 12-43-1, Wind Sentry Set Performance Check Form
Appendix B: CRBasic Program used for Verifying an RM Young Wind Sentry Set
Appendix C: Telemetry Station Datalogger and Radio Programming Operator Aid
### Wind Sentry Set Performance Check Form

**Date:** ____________  
**Operator(s):** ________________________

**Weather Conditions:** ________________________

**Wind Sentry / Data Logger S/N:** ____________  
As Found [ ] As Left [ ]

**Start Time:** ____________  
**End Time:** ____________

#### Wind Direction Signal Check
(Should be within ±5°)

<table>
<thead>
<tr>
<th>Expected Wind Direction (Degrees)</th>
<th>Datalogger Reading As Found (Degrees)</th>
<th>Datalogger Reading As Left (Degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>180°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>225°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>270°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>315</td>
<td></td>
<td></td>
</tr>
<tr>
<td>360° or 0°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Wind Direction Torque Threshold (0.3 gm-cm):**

#### Wind Speed Signal Check
(Should be within ±1.1 mph)

<table>
<thead>
<tr>
<th>Cup Wheel RPM</th>
<th>Expected Wind Speed (mph)</th>
<th>Datalogger Reading As Found (mph)</th>
<th>Datalogger Reading As Left (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>200</td>
<td>6.04</td>
<td>6.04</td>
<td>6.04</td>
</tr>
<tr>
<td>600</td>
<td>17.22</td>
<td>17.22</td>
<td>17.22</td>
</tr>
<tr>
<td>1200</td>
<td>34.00</td>
<td>34.00</td>
<td>34.00</td>
</tr>
<tr>
<td>1800</td>
<td>50.78</td>
<td>50.78</td>
<td>50.78</td>
</tr>
</tbody>
</table>

**Wind Speed Torque Threshold (0.3 gm-cm):**

**Comments:** ________________________

**Field Check Due Date:** ____________
Appendix B
CRBasic Program used for Verifying an RM Young Wind Sentry Set

' Sandia Carlsbad Hydrology Field Office
' Mike Farinacci, INTERA, 330-571-0828
' Program to verify Wind Sentry Set 2021-7-13

' 03002 Wind Sentry Set Wiring
'    Red   | P_LL
'    Green| SE5
'    Blue  | VX1
'    White| CR300 GRND Symbol
'    Black & Clear | CR300 'G'

Public Panel_Temp_degF, Batt_volt
Public WindDir : Units WindDir = degrees
Public WS_mph   : Units WS_mph = mph

DataTable (WindCal, 1, -1)
  Minimum (1, Batt_volt, FP2, False, False)
  Sample (1, Panel_Temp_degF, FP2)
  WindVector (1, WS_mph, WindDir, FP2, False, 0, 0, 1)
  Sample (1, WS_mph, FP2)
EndTable

BeginProg
  Scan (1, Sec, 1, 0)
    PanelTemp (Panel_Temp_degF, 60)
    Panel_Temp_degF = Panel_Temp_degF * 1.8 + 32
    Battery (Batt_volt)
    PulseCount (WS_mph, 1, P_LL, 1, 1, 1.677, 0.4)
    If WS_mph < 0.47 Then WS_mph = 0
    BrHalf (WindDir, 1, mV2500, 5, VX1, 1, 2500, False, 20000, 60, 352, 0)
    If WindDir >= 352 OR WindDir < 0 Then WindDir = 0
    CallTable WindCal
NextScan
EndProg
This document describes how to configure and program a Campbell Scientific CR300 datalogger for use in the SNL geohydrology program telemetry network. This document will provide you with a recipe to:

(1) Determine if the datalogger has the most recently released operating system, and, if not, update it,
(2) Configure the datalogger with the correct settings to function within the network,
(3) Tell Loggernet about the datalogger so it can correctly connect with it,
(4) Program the datalogger so it will collect data from the connected sensors, and
(5) Configure the radio settings.

Although these instructions may at first glance appear complicated, after performing the steps several times it will become clear what is happening.

**Background Information**

**What You Will Need**

- A laptop computer running Loggernet
- A USB-to-micro-USB cable (for datalogger)
- A USB-to-USB type B cable (for radio)
- The **Telemetry Configuration Spreadsheet**
- The CRBasic template program "Template_SDI-12.CR300"
- The radio template file "RF451_template.xml".

**Enclosure Construction**

This procedure assumes that enclosure construction and all wiring has been completed.

**Telemetry Configuration Spreadsheet**

Maintain a record of datalogger settings in the **Telemetry Configuration Spreadsheet**.

**Pakbus Encryption Key**

These instructions assume that the datalogger you are configuring has not previously been configured. If the datalogger has previously been configured, it is likely that the **Pakbus Encryption Key** has been set to "faneH-n5". If you cannot establish a connection to the datalogger, enter the Pakbus Encryption Key into the field on the “Setup” screen before attempting to connect.

**Loggernet Background**

Campbell Scientific **Loggernet** software has several modules that allow the user to perform different tasks related to the software, dataloggers, and data. Each module runs independently by clicking the corresponding button on the main Loggernet interface. Multiple modules can be open at any time, but only one module at a time can be connected to a given datalogger (e.g., if you are connected to a datalogger in **Device Configuration Utility** module, you will not be able to connect in the **Connect** module). The most important functions in the modules that are most useful are listed in Table 1.
**Table 1. Loggernet Module Functions.**

<table>
<thead>
<tr>
<th>Module</th>
<th>Task/Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setup</strong></td>
<td>Setup tells Loggernet (1) what kind of datalogger(s) you have, (2) how to connect to each datalogger (e.g., IP address or COM port), (3) what the Pakbus Address of each datalogger is, and (4) what the PakBus Encryption Key is (if used). Setup also includes an option to enable scheduled data downloads, set the data file path, and set the datalogger clock. Changes on this screen are not saved until “Apply” is clicked.</td>
</tr>
<tr>
<td><strong>Device Configuration Utility</strong></td>
<td>Allows user to send new operating systems to datalogger, set the Pakbus address of each datalogger, and other internal settings.</td>
</tr>
<tr>
<td><strong>Status Monitor</strong></td>
<td>Provides an overview of the status of all dataloggers by showing when each datalogger was last downloaded. Allows user to manually force a data collection. Also displays summary statistics for scheduled collection tries.</td>
</tr>
<tr>
<td><strong>Connect</strong></td>
<td>Allows user to connect to a datalogger using the method specified in <strong>Setup</strong>, send new programs to a datalogger or retrieve programs from a datalogger, set the datalogger clock, and see real-time values and variables.</td>
</tr>
<tr>
<td><strong>Shortcut</strong></td>
<td>Provides an interactive interface to create a simple datalogger program and is a great tool to learn CRBasic. The program you create can be edited later in CRBasic.</td>
</tr>
<tr>
<td><strong>CRBasic Editor</strong></td>
<td>A text editor to manually write a new (or edit an existing) datalogger program. The programming language used by Campbell Scientific dataloggers is called “CRBasic”. It is based on the BASIC computer programming language family.</td>
</tr>
</tbody>
</table>

**A Note on Radios and Ports**

The telemetry system uses RF451 radios. It is useful to think of these radios as very long cables connecting Loggernet on the base station computer to the datalogger in the field. Loggernet does not see the radios because the radios take care of the networking internally and Loggernet is oblivious to this.

This will become important when setting up Loggernet to connect with a datalogger via the telemetry system, because Loggernet needs to associate a communication port with each logger. Because the base station radio is connected to the computer with a USB cable (which mimics a COM port), Loggernet thinks that it is connecting to the datalogger over the COM port.

**Flash Memory**

The datalogger stores programs and data in flash memory. These will be retained even if the datalogger is not powered for extended time periods.

**Resetting USB (COM) Port Connection**

When connecting the datalogger to a laptop via the USB port, the computer configures the USB port as if it were a serial COM port (and hence Loggernet and documentation refers to a USB port as a “COM” port). If the computer will not connect to a datalogger via the USB connection, the issue may be that the COM port has been configured and opened by software (e.g. **Device Configuration Utility**), the COM port failed to close when the software closed, and the computer will not allow another piece of software to establish a connection through that COM port. In this case the COM port needs to be reset. Disconnect the datalogger from the computer, reboot the computer, and cycle power on the datalogger. Plug the USB cable back in and you should be able to connect to the datalogger using Device Configuration Utility. If the PakBus Address has been reset to 1 (by sending a new OS for example), you can reset it now to what it is supposed to be (see instructions in **Configure Datalogger** below).
Instructions to Configure Telemetry Datalogger and Radio

Download Newest Datalogger Operating System

1) Using laptop with Loggernet installed, go to https://www.campbellsci.com/cr300.
2) Log in or create an account.
3) Download the latest operating system (OS). This will be the first entry in the “Downloads” section near the bottom of the webpage.
4) Run the executable you just downloaded.
   a. This creates *.obj file in the folder C:\Campbellsci\Lib\OperatingSystems
   b. A PDF file will open that lists the changes and updates in the newest OS version. It is worthwhile to read this, because (1) often a bug has been fixed that had previously been causing issues, and (2) the document lists new capabilities and features that may be of interest.

Update Datalogger Operating System

5) Make sure datalogger is powered with 12VDC battery.
6) Start Loggernet, select “Utilities”, and run the Device Configuration Utility module.
7) Select “CR300 series” from the “Device Type” window on the left.
   a. If you have not connected to a CR300 previously using this computer, click the “Install the USB Driver” button. If you are not sure, just install it¹.
8) Connect datalogger to computer using USB cable.
9) In the “Communication Port” box, click the drop-down button and select the COM port that indicates that it has a CR300 connected to it.
10) Click the “Connect” button. A window should appear with datalogger settings.
    a. If the datalogger has already been configured, it may have been assigned a Pakbus Encryption Key. If you can’t connect, enter “faneH-n5” as the Pakbus Encryption Key.
11) Check the OS version. If it is older than the OS you downloaded, continue to the next step. Otherwise, skip to the next section of this document.
12) Click the “Disconnect” button.
13) Click the “Send OS” button at the top of the screen.
14) Follow the instruction that are given by Device Configuration Utility.
    a. You do not need to back up the device settings if this is a new datalogger that has not been deployed yet. After the OS update, we will configure the datalogger settings.

Configure Datalogger

15) Connect to the datalogger using Device Configuration Utility.
16) On the Datalogger tab:
    a. Verify that the logger has the latest OS Version.
    b. Set the Pakbus Address to a unique value. It can be any value between 1 and 3999 inclusive but must be unique. Refer to the Telemetry Configuration Spreadsheet. Update the Telemetry Configuration Spreadsheet to record the PakBus address.
    c. Set the Pakbus Encryption Key to “faneH-n5”.
17) On the “Network Services” tab:
    a. Check the box “Ping (ICMP) Enabled”.
18) Click “Apply”.
19) Close Device Configuration Utility.

¹ The most frequent cause of connection difficulties is the COM port selection in both Device Configuration Utility and Setup. When the CR300 is connected to the laptop via USB, the driver will identify it as a CR300, and Windows will assign a COM port number to it. Sometimes the assigned COM port number changes, but Loggernet doesn’t know this. Other times, the COM port may have been captured by another device that was plugged in and not properly released. If connection difficulties persist after troubleshooting, reboot the computer to reset all USB ports and cycle power on the datalogger, then verify that the COM port is correct.
Configure Loggernet to Communicate with the Datalogger

20) Make sure your datalogger is powered and connected to the USB port on the laptop.
21) Open the “Setup” module in Loggernet.
22) In the “View” dropdown, verify that “Standard” is selected. This tells Loggernet to display the entire network on the left and details of each node on the right.
23) Your screen should look similar to Figure 1. If there is a COM port root, continue to step 23. If there is not a COM port “root” in the network, you need to add one. This step only needs to be done once:
   a. Click “Add Root” and select “COM” port.
   b. Select “PakBus Port (PakBus Loggers)”.
   c. Select “CR300Series”, then click “Close”.
   d. Click “Apply”.
   e. You will now have a three-level tree. Refer to Figure 1:
      i. “COM_Sandia” is the COM port (yours will be named differently unless you change it). It is always at the root level in the tree structure. Select the COM port in your tree. In the “ComPort Connection” drop-down box, select the COM port that is associated with the CR300 datalogger.
      ii. The subordinate tree entry, “Sandia” in Figure 1, is the PakBus Port, a layer of software that facilitates PakBus communication. It is always second entry in the tree structure. You do not need to change any settings here.

![Figure 1. Loggernet Tree Structure with Root COM Port Highlighted.](image-url)
iii. The next subordinate tree entry, “Tower” is the datalogger. Yours will be named differently depending on which datalogger you are adding.

f. You now have a COM port root, a PakBus Port, and a CR300 data logger set up in your tree. Click “Apply” then continue to the next step.

24) If you have a COM port and PakBus Port already in your tree, then you only need to add a new datalogger to the PakBus Port:
   a. Select the PakBus Port (“Sandia” in Figure 1), then click “Add” in the ribbon.
   b. Select “CR300Series” datalogger, then click “Close”.

25) Edit the names in the tree by slow-double-clicking on them. The name of the datalogger should match the name of the well where it will be located. The names of the root COM port and the PakBus Port do not matter, so use something that makes sense.

26) Click “Apply”.

27) Select the datalogger in the tree and verify that the “Hardware” tab is selected.
   a. Enter the PakBus Address of the datalogger in the “PakBus Address” field. This is the unique value which you set when configuring the datalogger using Device Configuration Utility. Refer to the Telemetry Configuration Spreadsheet to verify the PakBus Address.
   b. Set the “PakBus Encryption Key” to “faneH-n5”.

28) Select the “Clock” tab.
   a. Click “Set Station Clock” after verifying that the laptop clock is correct.

29) Click “Apply”.

30) Loggenet is now configured to communicate with the datalogger.

Configure and Send Program to CR300

31) Open LoggerNet module CRBasic Editor.

32) Open the program “Template_SDI-12.CR300”. This is a CRBasic program template for the telemetry dataloggers. We will change a few things in the program, then upload it to the logger:
   a. First, save the template file with a new name so you do not overwrite the template file. Click “Save As” under the File tab. Name the file using this convention: “SiteName_SDI-12.CR300” where SiteName is the name of the well. For example, “SNL-13_SDI-12.CR300”.
   b. Line 35 is the DataTable command which instructs the logger to build an internal data table to store the data. In the template file, the data table name is C2737. Change it to match the name of the well the datalogger will be installed at. The data table name can only be alphanumeric characters (no special characters or spaces), and the name must start with a letter.
   c. Line 47 sets the sensor serial number using the variable Sensor_SN. This will be stored in the final data table to more easily track which sensor is being read for future data analyses. You can set this if you know what the sensor serial number is. Use quotes around the sensor serial number because it will be stored as a text string.
   d. Line 48 sets the well name using the variable Well_ID. This will be stored in the final data table. Set the Well_ID to the name of the well where the datalogger will be located. Use quotes around the Well_ID name, and you can use any characters because it is a text string, but do not use spaces.
   e. Line 72 calls the data table. Enter the name of the data table here. It must be the same name that you entered in the DataTable command in step 31(b). Do not use quotes.

33) Click “Save”.

34) Close CRBasic Editor. The program is ready to upload to the datalogger.

35) Run the LoggerNet module “Connect”.

36) Select the datalogger from the tree on the left.

37) Click “Connect”. Watch the plug icon that is part of the “Connect” button. When it shows the plug connected, you are connected.
38) Click “Send New”.
39) Select the program you edited and saved in Steps 31-32. Click “Open”.
40) Loggernet will warn you that you will lose data upon sending a new program. Click “Yes”.
41) The program is sent to the logger and the logger will compile it. Wait until Loggernet tells you that program compilation has finished.
42) The program is now running on the logger and collecting data. The program will always be running on the logger if the logger has power (e.g., if you unplug power from the logger, the program stops, but it will automatically run the program and continue collecting data when it is plugged back in).
43) Click the dropdown box under “Table Monitor” and select “Public”. The public table is shown. The public table holds the current values of all variables in the program. The program reads the battery voltage and panel temperature every 10 seconds. Verify that these variables make sense:
   a. Batt_volt should be between 12 and 14 volts.
   b. Panel_Temp_degF should make sense. This is the temperature of the thermistor inside the datalogger.
44) The PT2X is read once every 15 minutes, so there will not be a value for that variable until the program reads it. If a PT2X is connected, you can wait for the variables to populate and verify that the values make sense:
   a. Temperature_degF is the temperature of the PT2X.
   b. Pressure_psia is the pressure reading of the PT2X.
45) Click “Disconnect” to disconnect from the logger.
46) Verify that the datalogger information in the Telemetry Configuration Spreadsheet is complete by adding the datalogger type, datalogger serial number, datalogger OS version, and datalogger Pakbus Address.
47) You are now finished configuring the datalogger and Loggernet.

Configure RF451 Radio

48) Open the Loggernet module “Device Configuration Utility”.
49) Select “RF451” under the “Radios” entry in the “Device Type” tree on the left.
50) If you have not yet installed the USB driver for the RF451, click on “Install USB Driver”. You only need to do this once on each laptop.
51) Plug the USB-B cable into the radio and laptop.
52) Select the Communication Port associated with the RF451 radio.
53) Click “Connect”. The main window should display the radio settings.
54) Click “Read File” and select the file “RF451_template.xml”.
55) The settings from the template file will populate the page.
   a. Set the “Radio ID” to the PakBus Address of the datalogger it is attached to. No other settings need to be adjusted.
56) Click “Summary” and then “Save” the file with a name that identifies it with the well at which it will be located.
57) Click “Apply”. This will apply the settings to the radio, and you will automatically be disconnected. Unplug the USB cable. You are finished setting up the radio.

Set up Server-Room Loggernet to Communicate with the Datalogger and Test Communication

58) It is best to test radio communication before deploying the station to the field. Bring the station outside near the base station antenna, put an antenna cable on it, and make sure it is powered.
59) On the server-room Loggernet (base station), open the “Setup” module.
60) The tree will be similar to the one shown in Figure 2. Select the entry one place up the tree from the large group of dataloggers below it (in Figure 2, this is C-2737). This represents the last radio repeater in the system. (The tree structure of the dataloggers is only for visual representation of the network, it does not affect how Loggernet communicates).
61) Click “Add” and select “CR300 Series”, then “Close”.
62) Verify that the new datalogger is selected in the tree, and that the “Hardware” tab is selected.
   a. Set the PakBus Address to the PakBus Address of the datalogger (refer to the Telemetry Configuration Spreadsheet).
   b. Set the PakBus Encryption Key to “faneH-n5”.
63) Select the “Schedule” tab.
   a. Put a checkmark in the box “Scheduled Collection Enabled”.
   b. Set the “Collection Interval” to 1 day.
64) Select the “Data Files” tab.
   a. Click “Get Table Definitions”. This tells the datalogger to report to Loggernet its table structure. Loggernet should attempt to initiate radio connection with the datalogger, and it may take a few seconds to populate the data table window. See Figure 3. After Loggernet receives the information from the datalogger, you will see four tables, one of which is the one you created and named in the CRBasic program.
Figure 3. Datalogger Tables.

i. If you receive the table structure information from the datalogger, congratulations! It should also work in the field.
ii. If you do not receive the table structure and cannot establish radio communication, call Eric 605-381-9800.
b. Select the table you created in the CRBasic program (in Figure 3, it is named “H9bR”).
c. Check the check box “Included for Scheduled Collection”.
d. Uncheck the check box “Use Default File Name”.
e. In the box “Output File Name”, click the 3 dots icon on the right. This will open a file navigation window. Navigate to the folder where you want the data stored. Type in the file name and press “Open”.
f. Click “Apply”. The station can be deployed to the field.

65) To preserve battery life, unplug the battery until the datalogger is installed in the field and connected to a solar panel.
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