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TWP BBSS Launch Operations at Manus and Nauru Facilities

I. Purpose:

The purpose of this procedure is to describe the work process performed by the on-site observers to perform the launch of the Balloon-Borne Sounding System (BBSS) (Vaisala DigiCORA III) at the TWP Facilities in Manus and Nauru.

It is important to be ready to launch on time. Balloons need to be launched at 11:30 and 23:30 UTC. The other countries in the Pacific and around the world will be trying to release their balloons at the same time so that a “snap shot” of the atmosphere at 00:00 and 12:00 UTC is taken. This is best for forecasting purposes and an accurate climate record.

It is important to give yourself plenty of time so that if you need to prepare a second sonde, you will still be able to release the balloon on time.

II. Cautions and Hazards:

- Take care in operating the hydrogen generator during balloon filling (see safety procedures for hydrogen generator).
- Launch only under safe meteorological conditions: Wind speeds below 15 m/s, no electrical storms.
- The sondes are very fragile, so handle them carefully.
- The desiccant in the GC25 Ground Check Set must be changed periodically. It should be changed weekly or whenever the radiosonde RH reading while in the GC25 exceeds 1%, whichever comes sooner.
- Save used desiccant in an airtight jar for reusing later. See PRO(BBSS)-025 for drying desiccant for reusing in the GC25.

III. Requirements:

- DigiCORA III
- RS92 GPS Radiosonde package, SGPD (w/ 9.5V battery)
- Meteorological balloon (350 grams)
- Remote Balloon Launcher (RBL)
- Cable ties or string to tie off balloon.
- Bung, nozzle, needle
- Hydrogen Generator (Electrolyser or HOGEN)
- Electrolyser/HOGEN enclosure

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- Gas-flow valve box
- GPS omni-directional antenna
- GC25 Ground Check Set (GCS)
- Aspirated box for pre-launch sonde conditioning
- Laptop PC with BBSS and PCMF software
- Safety glasses

IV. Procedure:

PRE-RELEASE PREPARATION (30 minutes before release time):

Check if any airplane flights are scheduled for arrival or departure at Nauru airport. Telephone the tower 10 minutes before the release to ask permission to launch the balloon if air traffic is expected.

PREPARE BALLOON TRAIN (20 minutes before release time):

1. Go to E-Van.

- 1) Turn on BBSS Computer using the switch on the side of the laptop computer (if not already ON). **Note: If it's already ON, press ESC and then press Y to exit the BBSS program. It will return to Desktop.** Double-click the "beach ball" icon (it is labeled "MV" at Nauru; "Balloon" at Manus) on the desktop to restart the BBSS program.
- 2) Check the **year, month, and time** for correctness (if incorrect, note in comments in the Daily Rounds), then press "Enter" key (this will be the launch "time stamp"). It is important to do this before turning on the DigiCORA.
- 3) Turn the DigiCORA OFF (if necessary) and then ON (power up takes 5-10 minutes).

2. Go to Balloon Van.

- 1) Retrieve a balloon, a bung, a nozzle, and a sonde string (or a cable tie).
- 2) Put the nozzle in the bung.
- 3) Put the arrow point needle on the nozzle.
- 4) Put the nozzle in the bung press.
- 5) Press the nozzle into the bung.
- 6) Pull out the bung and remove the arrow point needle.

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- 7) Put the neck of the balloon into the balloon neck-expanding jig.
- 8) Put the bung into the neck of the balloon.
- 9) Pull the balloon off the neck-expanding jig (REMEMBER to push from the top and pull from the bottom).
- 10) Put string around the neck of balloon.
- 11) Get an RS92 radiosonde package out. **Note: Use the oldest sonde first.**

3. Go to Ground Check Set (GCS).

- 1) Open the radiosonde package and carefully remove the RS92 and unwinder. **Note: The sensor boom is extremely fragile.**
- 2) Inspect the temperature sensor visually for any damage (see Figure 1). If the temperature sensor is damaged in any way, do not use the radiosonde.

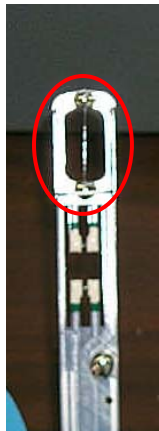


Figure 1: RS92 sensor boom (temperature sensor in red circle)

- 3) Open the GC25 Ground Check Set chamber door by releasing the latch (see Figure 2).

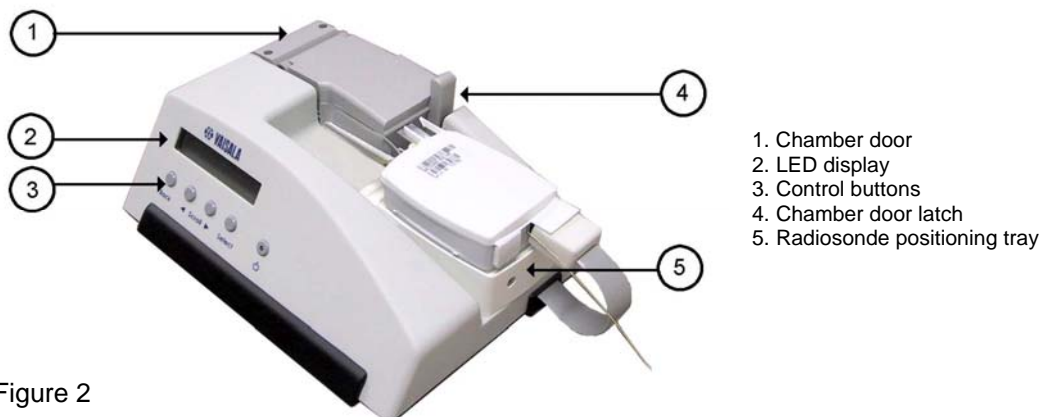


Figure 2

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- 4) Carefully place the RS92 with its barcode label up as shown in Figure 2, making sure it fits in the indentation on the positioning tray. Close the chamber door.
- 5) Insert the GC25 connector into the corresponding receptacle on the RS92, making sure the connector is oriented so that the word “UP” is showing on top.
- 6) Turn on the GC25 by pushing the power button (far right on the front panel with a light). The display will briefly read the following: “Identifying...,” “RECOND. U-SENSOR,” and “YES.”
- 7) Push the “Select” button. A 3-minute timer will start. Wait until the timer is finished.
- 8) The display should read, “FREQUENCY 402.74 MHZ” (or something close to 403). If the frequency needs to be changed, use the arrow buttons to display “YES” and push the “Select” button when prompted to “TUNE FREQ PERIOD?” Use the arrow buttons to tune to a desired frequency, and then push the “Select” button.
- 9) Select “NO” when prompted to “TIMER DISABLED SET TIME?”
- 10) Push the “Select” button in response to the prompt “GRND CHK MODE PRESS SELECT.”

4. Go to the DigiCORA III.

- 1) The screen should look like the following (Figure 3):

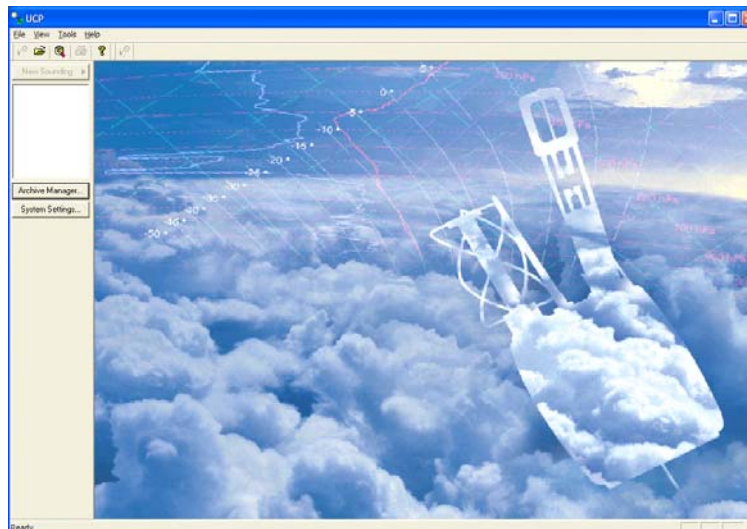


Figure 3: DigiCORA III initial screen

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- 2) If the screen (Figure 3) is not displayed, double-click on the DigiCORA III icon on the desktop.
- 3) Click on “New Sounding.” The screen should look like the following (Figure 4):

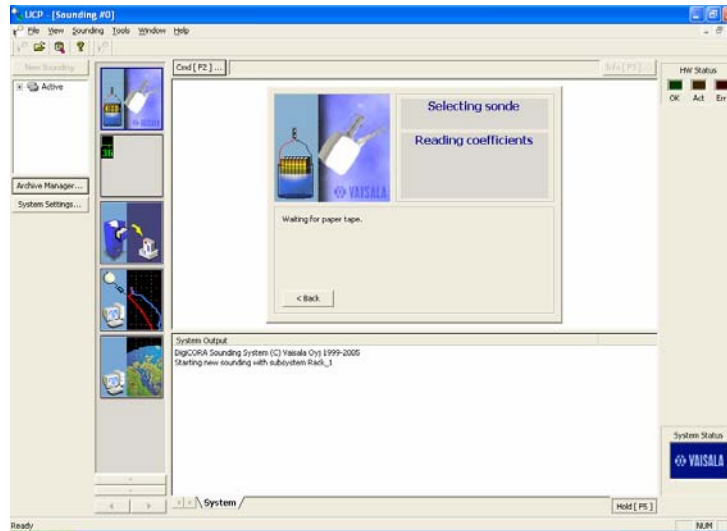


Figure 4

Note: Because the RS92-SGP radiosondes do not use calibration tapes, the calibration data are transmitted to the DigiCORA III by radio from the GC25 Ground Check Set.

- 4) If the DigiCORA III asks for a calibration tape (it shouldn't), click on the “Back” button and go to step 5. Otherwise go to step 6.
- 5) Click on “Radio” on the screen as shown in Figure 5.

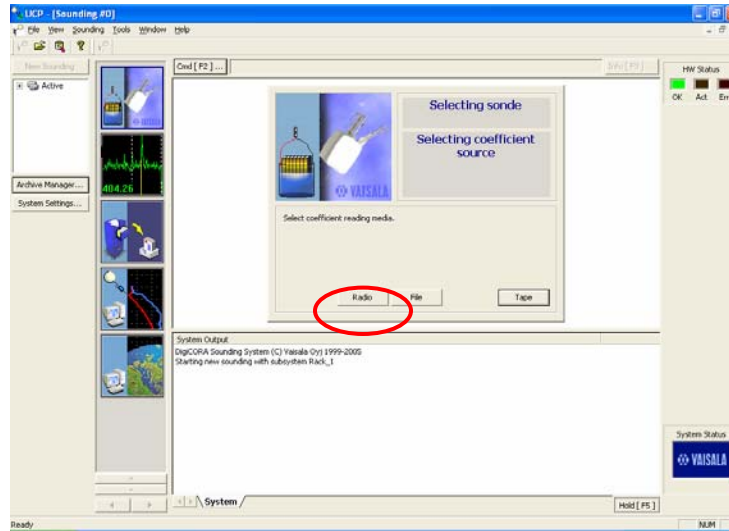


Figure 5

- 6) The RS92 radiosonde will be transmitting at the frequency you selected. Click on the spectrum window and then click on “Find” so that the DigICORA III can receive the signal (Figure 6).

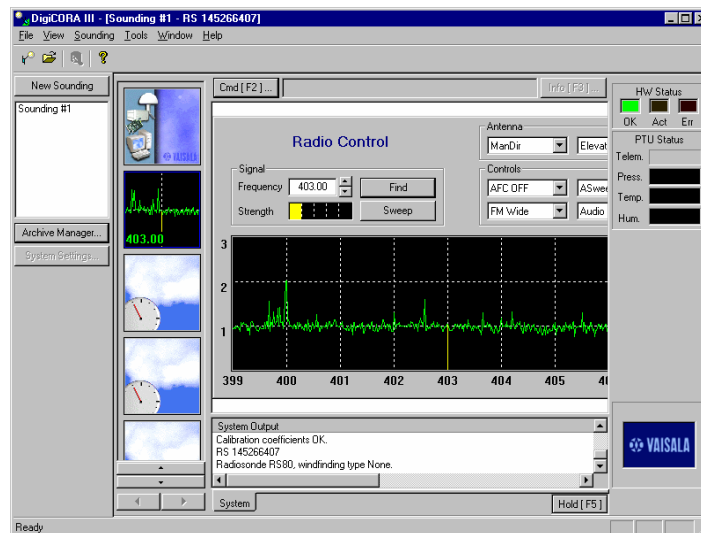


Figure 6

- 7) Once the system has found the radiosonde, click on the top left icon (see Figure 7) to get back to the control screen. You should see a screen as shown in Figure 8.

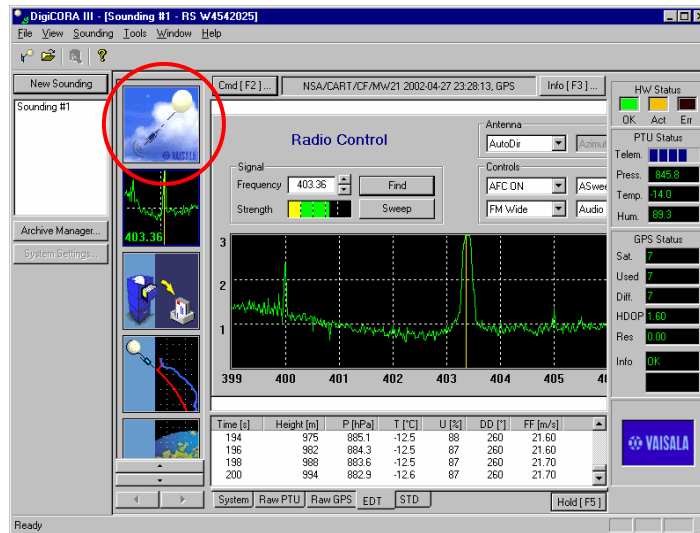


Figure 7

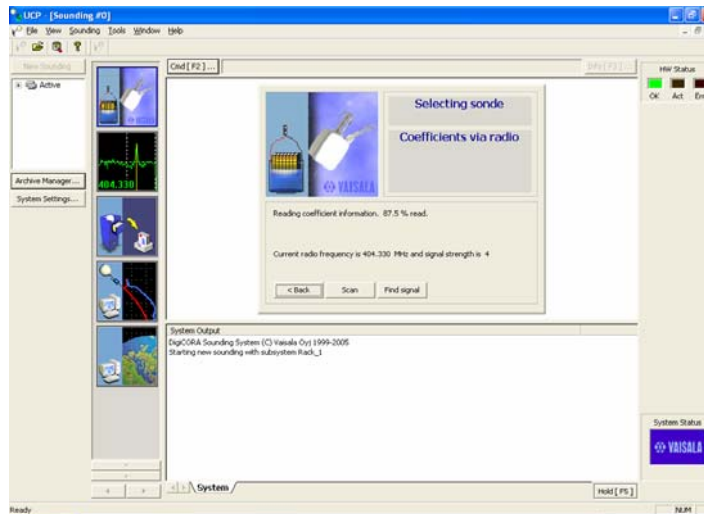


Figure 8

- 8) When the coefficients have been read 100%, click on "Next," and you will see the following screen (Figure 9a). Verify the serial number and radiosonde type, and then click on "Next."

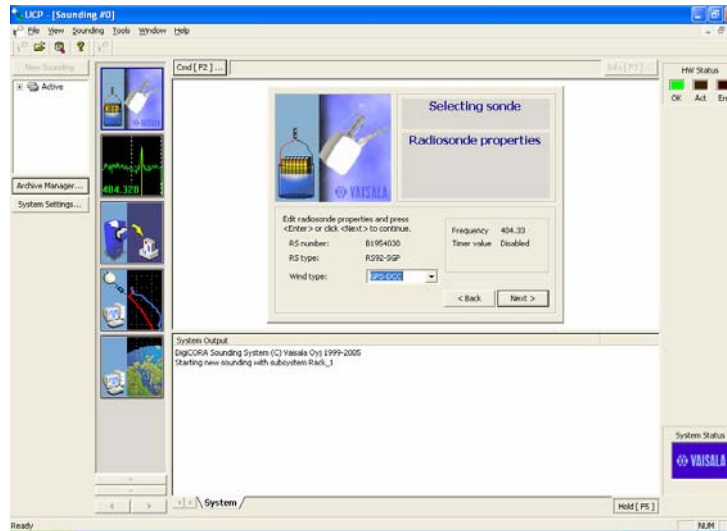


Figure 9a

- 9) Enter the sounding number using our usual codes: **XXMMDDYYn**, where **XX** is 21 for Manus, 22 for Nauru, and 90 for AMF (see Figure 9b). Click on “Next.”

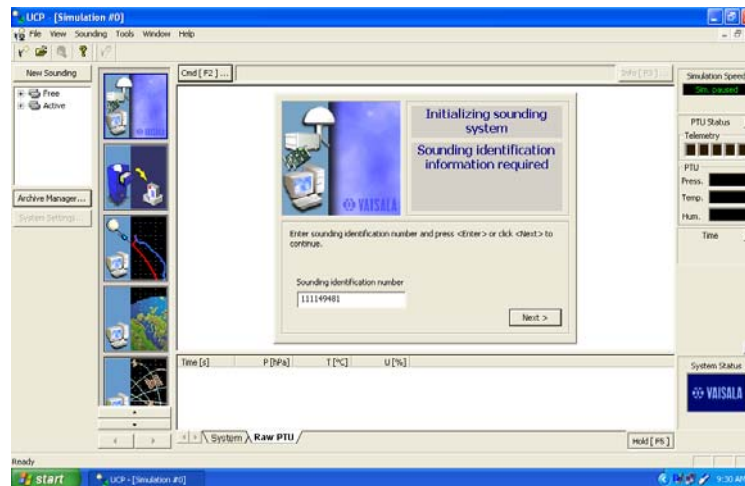


Figure 9b

- 10) The system will go through initialization process. Click on “Perform GC” when the following screen (Figure 10) appears.

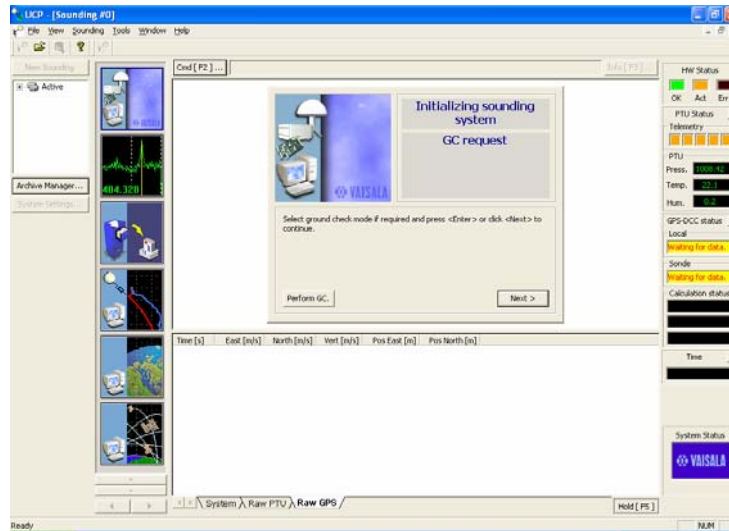


Figure 10

- 11) Wait until you see the next screen (Figure 11). The spaces for Pressure, Temperature, and Humidity will be blank in the middle window. Do the following:
- Read the pressure value from the “Current stabilized sonde values are” note (located above the blank boxes) you see in the “Ground check” window. Enter this value in the pressure entry box.
 - Enter the temperature shown on the GC25 unit LED display window (see Figure 2) in the blank temperature box in the “Ground check” window.
 - Type “0” in the blank humidity box.
 - Click on “Next.”

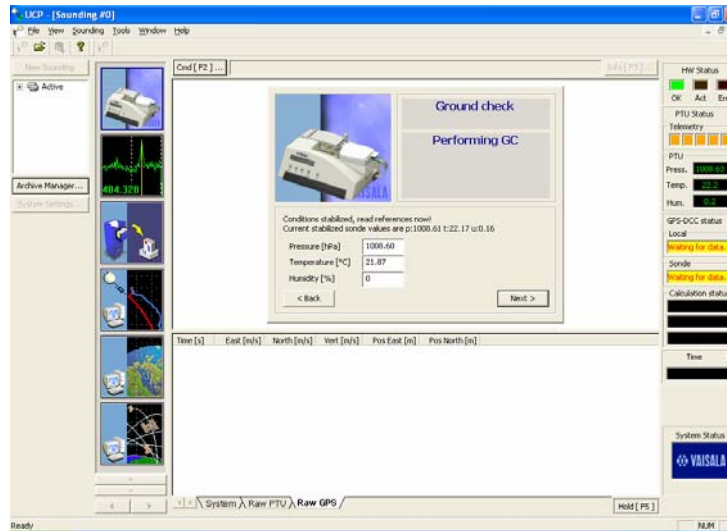


Figure 11

- 12) The next screen (Figure 12) will give you a chance to correct any typing errors you may have made when entering the ground check data.
- 13) If everything looks OK, click on “Next.” If you need to change any values, click on “Back” and try again.

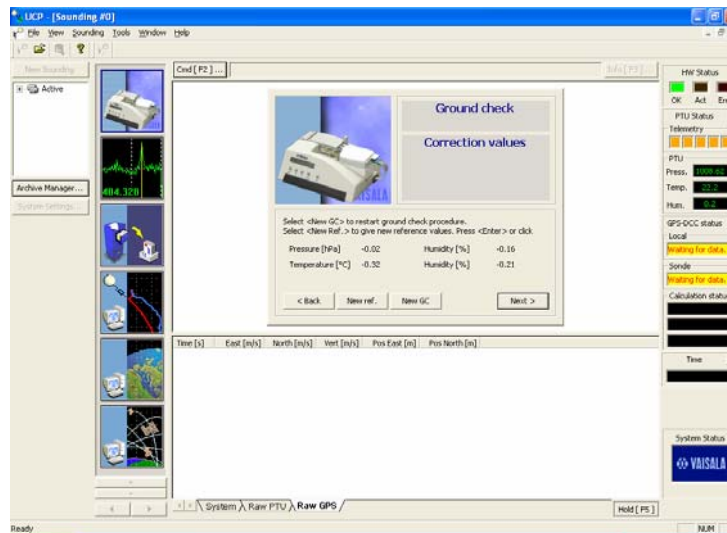


Figure 12

- 14) When the screen says, “Ready for sonde release,” open the chamber door on the GC25 Ground Check Set and carefully remove the radiosonde from the GC25. **Be sure to close the chamber door securely.**

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- 15) Remove the GC25 cable from the RS92 radiosonde, attach the battery connector to the radiosonde, and snap the plastic tub containing the battery onto the radiosonde. **Note: You may have to squeeze the sides of the tub a little so that it will fit.** Once the battery tub is snapped on the radiosonde, it is secure.
- 16) Turn off the GC25. **Make sure the chamber door is closed securely.**
- 17) Carefully position the sensor boom so that it snaps into and is captured by the two plastic pieces at the top of the radiosonde. When the sensor boom is in the correct position, it should be at approximately 30-degree angle to the radiosonde (see Figure 13).



Figure 13

- 18) Place the radiosonde with the sensor boom up on the counter.

FILL BALLOON

1. Go to Electrolyser Enclosure.

- 1) Inside the Electrolyser Enclosure, turn the voltage down to 0.
- 2) Inside the Electrolyser Enclosure, turn on the balloon filling valve (**V-15 at Manus; V-9 at Nauru**). **Note:** wait until the compressor has stopped if it is pumping to the gasholder.

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- 3) Get the stopwatch.
2. **Turn on Remote Balloon Launcher (RBL) water spray for 3 seconds before putting the sonde on the tray.**
3. **Get the radiosonde and go back to RBL.**
4. **Prepare balloon train on launch tray, attach black cord to string unwinder, and double-check that nothing is likely to get tangled up at launch.**
 - 1) Put sonde in sonde slot (sensors pointing to the air tube).
 - 2) Put string on balloon and sonde.
 - 3) Make a slip knot (the knot of the loop should be half way in the loop, not at either end you are attaching to).
 - 4) Put the slip knot at the bottom of the bung and make the knot tight.
 - 5) Put the nozzle into the nozzle holder.
 - 6) Make another slip knot and attach the sonde.
 - 7) Put on the string unwinder inhibitor.
 - 8) Open up the balloon.
 - 9) Verify Velcro strap attachment.

Note: The buttons in the strap face down and lock into the string winder assembly. The Velcro strap must be put on tightly. The sonde must be laid in such a way so that there is no tangled cabling on the launch table.
 - 10) Shut the RBL door.
5. **Go to Electrolyser Enclosure at Gas-Flow Valve Box.**
 - 1) Slowly turn on the Gas-Flow Valve and start the stopwatch.
 - 2) Observe the balloon inflate.
 - 3) After 4 minutes at Manus, and 3 minutes and 20 seconds at Nauru, close the Gas-Flow Valve.
 - 4) Return the stopwatch to the Electrolyser.
6. **Go to Release Point and pull balloon release lever to release balloon.**
7. **Immediately after release, switch off the flashing light and aspirator fan. Get nozzle and close RBL.**

AFTER RELEASE

1. **Enter Wind Direction and Speed.**

- 1) When you get back to the computer, you should see the following screen (Figure 14):

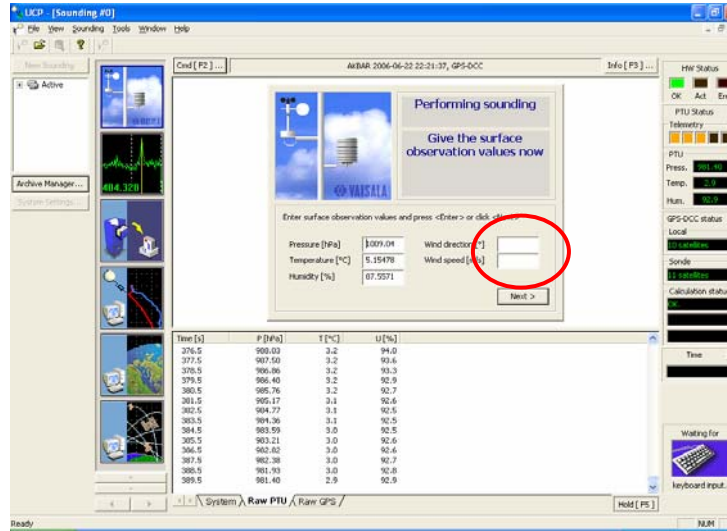


Figure 14

- 2) Enter wind direction and speed obtained from the SMET computer. Click on "Next."
2. Regularly check the frequency by pushing the **Telem** button.
 - 1) *It should be around 403 Mhz (left hand side of screen), and you should see at least one star (*) on the right hand side of the screen. The more (*) the better. If there is at least one star (*) and it is not beeping the sounding should be OK and does not need to be altered. However if it starts beeping check the frequency by pushing the button marked **Telem**. If the frequency is not close to the release frequency that you wrote down at the start, you can use the **Tune UP** or **Tune DN** button to adjust it to what it was before release to increase the signal strength indicated by the (*). When you see a star (*) again and the frequency is around 403 Mhz it should stop beeping after about 10 seconds.*
 3. To check the number of satellites push the buttons **status** then **GPS**.
 - 1) *There should be at least four (4) out of eight (8) figure 1s (example 11001001) on the right hand side in the section REM (Remote). At least four (4) figure 1s are needed to give good wind speed and direction. If it doesn't there are two reasons why this could be. It might be that the string unwinder has not properly functioned and the sonde cannot see the satellites well. An indication of this is, the figure 1s and 0s are swapping around quickly, or if the number of 1s changes often from say two to three to one and back to four. If this happens you can hope the unwinder will*

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work later in the flight (it usually does improve). If you see this you can write a note on the sheet in the "comments column" saying something like "less than 4 satellites during early part of flight." The other reason why there may not be many figure 1s is that the GPS part of the sonde may be faulty. There is not much that can be done if this is the case.

4. If there are at least four (4) figure 1s and the DigiCORA is not beeping, you can go out to the RBL and collect the unwinder suppresser block and rewind the cord (at Nauru only).
5. Go to Electrolyser Enclosure and turn balloon filling lever (V-9 at Nauru) to the closed position. And then return the voltage to around 230V.
6. Continue to monitor the launch with DATA and TELEM to adjust reception (stars indicate signal strength; 1-5 is best).
7. If you are satisfied that the sounding is normal, punch DATA key twice to get into "monitoring data" mode. (See Appendix 4, Data Monitoring During Sounding, in DigiCORA User's Guide.)
8. On the BBSS computer, check the program to verify the GPSWND.RAW file size is increasing in size. If it is not, note in comments in Daily Rounds.
9. Ensure printer paper is loaded in tractor feed of the printer (the printer is powered when the YELLOW power and SEL lights are ON).
10. The launch ends automatically (message appears on DigiCORA if still in data monitoring mode).
11. If balloon breaks prematurely (at a pressure greater than 700 hPa), launch another sonde.
 - 1) Toggle TELEM and then press TEMP and PILOT to print messages on printer. (DO NOT press LIST or STATUS button.)
 - 2) On BBSS Computer press ESC and then press Y (Names of files appear on screen and then BBSS program exits).

Important note: Make sure you ESC and exit out of the BBSS program before the next flight.
11. Enter values from the Surface Release Condition & Flight Details Form into Synoptic Weather Report along with sonde serial number (Manus only).
12. When a Pre-Flight Sonde Check Form is full, file it on site.
13. Turn OFF DigiCORA by pressing OFF and ENABLE simultaneously.
Note: To reset and restart, press ENABLE and RESET simultaneously.
14. Wait about three hours and then turn OFF the Electrolyser (this depends upon the next launch schedule).

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V. References:

1. PRO(BBSS)-005, Accessing Initial SMET Launch Data.
2. Australian BOM recommended procedures from Nauru99.

VI. Attachments:

- 1) BBSS Launch Operation Pre-Flight Sonde Check Form (sample).
- 2) BBSS Launch Operation Pre-Flight Sonde Check Form (blank).

